

Harbor Point
Baltimore, Maryland

Pre-Construction Air Monitoring
Hexavalent Chromium
24 April 2013 through 9 July 2013

24 September 2013

Environmental Resources Management
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File No: 0199768

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This analytical quality assurance report is based on the review of hexavalent chromium data for selected air samples and associated field quality control samples collected at the Harbor Point site in Baltimore, Maryland. The samples were collected 24 April 2013 through 9 July 2013 as a part of the project air monitoring plan. The analytical method that was used for the analysis is summarized and referenced in Attachment 1. The sample IDs, sample locations, laboratory ID numbers, sample collection dates, and sample matrices are presented in Table 1-1. Data summary tables presenting the validated and qualified results are included in Attachment 2.

Data for these analyses have been reviewed for adherence to the specified analytical protocol, the laboratory standard operating procedure (SOP), and the Pre-Construction Air Monitoring Plan (ERM, 11 April 2013). Results for the hexavalent chromium analysis have been validated or qualified according to general guidance provided in the "USEPA Region III Innovative Approaches to Data Validation, June 1995, Level IM1" and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review" (January 2010).

Table 1-1 **Summary of Sampling Data Reviewed**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011301787</i>				
249448	PAM-4	0004	4/24/13	Air
249418	PAM-1	0008	4/25/13	Air
249435	PAM-2	0009	4/25/13	Air
249408	PAM-3	0010	4/25/13	Air
249437	PAM-4	0011	4/25/13	Air
249447	PAM-6	0013	4/25/13	Air
249446	PAM-7	0014	4/25/13	Air
249405	Field Blank	0015	4/25/13	Blank
249426	Media Blank	0016	4/25/13	Blank
249412	PAM-1	0017	4/26/13	Air
249401	PAM-2	0018	4/26/13	Air
249406	PAM-4	0020	4/26/13	Air
249403	PAM-5	0021	4/26/13	Air
249442	PAM-6	0022	4/26/13	Air
249425	PAM-7	0023	4/26/13	Air
249410	PAM-1	0024	4/27/13	Air
249417	PAM-2	0025	4/27/13	Air
249420	PAM-3	0026	4/27/13	Air
249432	PAM-4	0027	4/27/13	Air
249413	PAM-5	0028	4/27/13	Air
249428	PAM-6	0029	4/27/13	Air
249424	PAM-7	0030	4/27/13	Air
249404	PAM-1	0032	4/28/13	Air
249409	PAM-2	0033	4/28/13	Air
249407	PAM-3	0034	4/28/13	Air
249441	PAM-4	0035	4/28/13	Air
249429	PAM-5	0036	4/28/13	Air
249431	PAM-6	0037	4/28/13	Air
249411	PAM-7	0038	4/28/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011301915</i>				
249439	PAM-1	0001	4/29/13	Air
249433	PAM-2	0002	4/29/13	Air
249443	PAM-3	0003	4/29/13	Air
249449	PAM-4	0004	4/29/13	Air
249422	PAM-5	0005	4/29/13	Air
249430	PAM-6	0006	4/29/13	Air
249444	Media Blank	0008	4/29/13	Blank
249440	PAM-1	0009	4/30/13	Air
249423	PAM-2	0010	4/30/13	Air
249402	PAM-3	0011	4/30/13	Air
249335	PAM-5	0013	4/30/13	Air
249337	PAM-6	0014	4/30/13	Air
249329	PAM-1	0016	5/1/13	Air
249913	PAM-2	0017	5/1/13	Air
249327	PAM-3	0018	5/1/13	Air
249344	PAM-4	0019	5/1/13	Air
249320	PAM-5	0020	5/1/13	Air
249326	PAM-6	0021	5/1/13	Air
249304	PAM-1	0023	5/2/13	Air
249323	PAM-4	0026	5/2/13	Air
249338	PAM-5	0027	5/2/13	Air
249318	PAM-6	0028	5/2/13	Air
249339	PAM-7	0029	5/2/13	Air
249317	PAM-1	0030	5/3/13	Air
249342	PAM-2	0031	5/3/13	Air
249343	PAM-3	0032	5/3/13	Air
249340	PAM-4	0033	5/3/13	Air
249346	PAM-5	0034	5/3/13	Air
249348	PAM-4	0040	5/5/13	Air
249309	PAM-1	0046	5/4/13	Air
249347	PAM-4	0050	5/4/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011302079</i>				
249341	PAM-1	0008	5/7/13	Air
249244	PAM-5	0012	5/7/13	Air
249246	PAM-7	0014	5/7/13	Air
249338	Field Blank 1	0015	5/8/13	Blank
249227	PAM-1	0016	5/8/13	Air
249220	PAM-1	0029	5/11/13	Air
249223	PAM-2	0030	5/11/13	Air
249234	PAM-3	0031	5/11/13	Air
249247	PAM-4	0032	5/11/13	Air
249206	PAM-5	0033	5/11/13	Air
249224	PAM-6	0034	5/11/13	Air
249218	PAM-7	0035	5/11/13	Air
249231	PAM-1	0036	5/12/13	Air
249245	PAM-2	0037	5/12/13	Air
249229	PAM-3	0038	5/12/13	Air
249205	PAM-5	0040	5/12/13	Air
249214	PAM-6	0041	5/12/13	Air
249216	PAM-7	0042	5/12/13	Air
249225	PAM-1	0043	5/13/13	Air
249241	PAM-2	0044	5/13/13	Air
249201	PAM-3	0045	5/13/13	Air
249235	PAM-4	0046	5/13/13	Air
249210	PAM-5	0047	5/13/13	Air
249204	PAM-6	0048	5/13/13	Air
249200	PAM-7	0049	5/13/13	Air
249248	Media Blank 1	0050	5/13/13	Blank
<i>EMSL Project Number 011302355</i>				
249262	1	0001	5/24/13	Air
249696	2	0002	5/24/13	Air
249673	3	0003	5/24/13	Air
249682	4	0004	5/24/13	Air
249686	5	0005	5/24/13	Air
249683	6	0006	5/24/13	Air
249695	7	0007	5/24/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011302356</i>				
249610	PAM-2	0001	5/29/13	Air
249614	PAM-3	0002	5/29/13	Air
249612	PAM-4	0003	5/29/13	Air
249615	PAM-5	0004	5/29/13	Air
249631	PAM-6	0005	5/29/13	Air
249602	PAM-7	0006	5/29/13	Air
249634	Media Blank 2	0007	5/29/13	Blank
<i>EMSL Project Number 011302360</i>				
249662	PAM-1	0001	5/23/13	Air
249691	PAM-2	0002	5/23/13	Air
249677	PAM-3	0003	5/23/13	Air
249688	PAM-4	0004	5/23/13	Air
249679	PAM-5	0005	5/23/13	Air
249672	PAM-6	0006	5/23/13	Air
249652	PAM-7	0007	5/23/13	Air
<i>EMSL Project Number 011302582</i>				
249629	PAM-1	0001	6/3/13	Air
249618	PAM-2	0002	6/3/13	Air
249619	PAM-3	0003	6/3/13	Air
249635	PAM-4	0004	6/3/13	Air
249642	PAM-6	0006	6/3/13	Air
249643	PAM-7	0007	6/3/13	Air
<i>EMSL Project Number 011302641</i>				
GTA-1	PAM-1	0001	6/12/13	Air
GTA-2	PAM-2	0002	6/12/13	Air
GTA-3	PAM-4	0003	6/12/13	Air
GTA-4	PAM-6	0004	6/12/13	Air
<i>EMSL Project Number 011302645</i>				
GTA-5	PAM-1	0001	6/13/13	Air
GTA-6	PAM-2	0002	6/13/13	Air
GTA-7	PAM-4	0003	6/12/13	Air
GTA-8	PAM-6	0004	6/13/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011302673</i>				
249488	OSAM-1	0001	6/13/13	Air
249475	OSAM-3	0003	6/13/13	Air
249464	PAM-1	0004	6/13/13	Air
249491	PAM-2	0005	6/13/13	Air
249497	PAM-3	0006	6/13/13	Air
249492	PAM-4	0007	6/13/13	Air
249476	PAM-5	0008	6/13/13	Air
249493	PAM-6	0009	6/13/13	Air
249485	PAM-7	0010	6/13/13	Air
<i>EMSL Project Number 011302674</i>				
249459	OSAM-1	0001	6/16/13	Air
249577	OSAM-2	0002	6/16/13	Air
249591	OSAM-3	0003	6/16/13	Air
249480	PAM-1	0004	6/16/13	Air
249593	PAM-2	0005	6/16/13	Air
249473	PAM-3	0006	6/16/13	Air
249498	PAM-4	0007	6/16/13	Air
249584	PAM-5	0008	6/16/13	Air
249585	PAM-6	0009	6/16/13	Air
249565	PAM-7	0010	6/16/13	Air
<i>EMSL Project Number 011302677</i>				
249501	OSAM-3	0002	6/11/13	Air
249487	PAM-1	0003	6/11/13	Air
249455	PAM-2	0004	6/11/13	Air
249496	PAM-3	0005	6/11/13	Air
249486	PAM-4	0006	6/11/13	Air
249463	PAM-5	0007	6/11/13	Air
249468	PAM-6	0008	6/11/13	Air
249467	PAM-7	0009	6/11/13	Air
<i>EMSL Project Number 011302678</i>				
249495	OSAM-1	0001	6/12/13	Air
249537	OSAM-2	0002	6/12/13	Air
249477	OSAM-3	0003	6/12/13	Air
249529	PAM-1	0004	6/12/13	Air
249500	PAM-2	0005	6/12/13	Air
249474	PAM-3	0006	6/12/13	Air
249484	PAM-4	0007	6/12/13	Air
249465	PAM-5	0008	6/12/13	Air
249466	PAM-6	0009	6/12/13	Air
249457	PAM-7	0010	6/12/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 01130680</i>				
249483	OSAM-2	0001	6/14/13	Air
249460	OSAM-3	0002	6/14/13	Air
249458	PAM-1	0003	6/14/13	Air
249478	PAM-2	0004	6/14/13	Air
249472	PAM-3	0005	6/14/13	Air
249469	PAM-4	0006	6/14/13	Air
249490	PAM-6	0008	6/14/13	Air
249462	PAM-7	0009	6/14/13	Air
249454	Media Blank	0010	6/14/13	Blank
<i>EMSL Project Number 011302682</i>				
GTA-13	PAM-1	0001	6/15/13	Air
GTA-14	PAM-2	0002	6/15/13	Air
GTA-15	PAM-4	0003	6/15/13	Air
GTA-16	PAM-6	0004	6/15/13	Air
<i>EMSL Project Number 011302685</i>				
GTA-9	PAM-1	0001	6/14/13	Air
GTA-10	PAM-2	0002	6/14/13	Air
GTA-11	PAM-4	0003	6/14/13	Air
GTA-12	PAM-6	0004	6/14/13	Air
<i>EMSL Project Number 011302783</i>				
249592	OSAM-2	0002	6/17/13	Air
249586	PAM-1	0004	6/17/13	Air
249580	PAM-2	0005	6/17/13	Air
249588	PAM-3	0006	6/17/13	Air
249596	PAM-5	0008	6/17/13	Air
249553	PAM-6	0009	6/17/13	Air
249597	PAM-7	0010	6/17/13	Air
249583	Media Blank 1	0011	6/17/13	Blank
<i>EMSL Project Number 011302729</i>				
249521	1	0001	6/8/13	Air
249546	2	0002	6/8/13	Air
249506	3	0003	6/8/13	Air
249505	4	0004	6/8/13	Air
249538	5	0005	6/8/13	Air
249508	7	0007	6/8/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011302771</i>				
249456	OSAM-1	0001	6/15/13	Air
249481	OSAM-2	0002	6/15/13	Air
249489	OSAM-3	0003	6/15/13	Air
249471	PAM-1	0004	6/15/13	Air
249452	PAM-2	0005	6/15/13	Air
249461	PAM-3	0006	6/15/13	Air
249453	PAM-4	0007	6/15/13	Air
249482	PAM-6	0009	6/15/13	Air
249450	PAM-7	0010	6/15/13	Air
249479	PAM-1	0011	6/15/13	Blank
<i>EMSL Project Number 011302826</i>				
249549	2	0002	6/7/13	Air
249502	3	0003	6/7/13	Air
249547	4	0004	6/7/13	Air
249528	5	0005	6/7/13	Air
249518	7	0007	6/7/13	Air
<i>EMSL Project Number 011302840</i>				
249698	1	0001	5/26/13	Air
249655	2	0002	5/26/13	Air
249666	3	0003	5/26/13	Air
249684	4	0004	5/26/13	Air
249651	5	0005	5/26/13	Air
249653	6	0006	5/26/13	Air
249656	7	0007	5/26/13	Air
<i>EMSL Project Number 011302841</i>				
249215	PAM-2	0002	5/14/13	Air
249249	PAM-3	0003	5/14/13	Air
249237	PAM-6	0006	5/14/13	Air
249202	PAM-7	0007	5/14/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011302859</i>				
GTA-17	PAM-1	0001	6/20/13	Air
GTA-18	PAM-2	0002	6/20/13	Air
GTA-19	PAM-4	0003	6/20/13	Air
<i>EMSL Project Number 011302860</i>				
249556	OSAM-1	0001	6/19/13	Air
249558	OSAM-2	0002	6/19/13	Air
249590	OSAM-3	0003	6/19/13	Air
249571	PAM-1	0004	6/19/13	Air
249587	PAM-2	0005	6/19/13	Air
249562	PAM-3	0006	6/19/13	Air
249570	PAM-4	0007	6/19/13	Air
249559	PAM-5	0008	6/19/13	Air
249573	PAM-6	0009	6/19/13	Air
<i>EMSL Project Number 011302876</i>				
GTA-25	PAM-1	0001	6/22/13	Air
GTA-26	PAM-2	0002	6/22/13	Air
GTA-27	PAM-4	0003	6/22/13	Air
GTA-28	PAM-6	0004	6/22/13	Air
<i>EMSL Project Number 011302877</i>				
GTA-21	PAM-1	0001	6/21/13	Air
GTA-22	PAM-2	0002	6/21/13	Air
GTA-23	PAM-4	0003	6/21/13	Air
GTA-24	PAM-6	0004	6/21/13	Air
<i>EMSL Project Number 011302878</i>				
GTA-29	PAM-1	0001	6/23/13	Air
GTA-30	PAM-2	0002	6/23/13	Air
GTA-31	PAM-4	0003	6/23/13	Air
GTA-32	PAM-6	0004	6/23/13	Air
<i>EMSL Project Number 011302879</i>				
249578	OSAM-1	0001	6/18/13	Air
249594	OSAM-2	0002	6/18/13	Air
249552	PAM-1	0004	6/18/13	Air
249550	PAM-2	0005	6/18/13	Air
249568	PAM-3	0006	6/18/13	Air
249567	PAM-4	0007	6/18/13	Air
249595	PAM-5	0008	6/18/13	Air
249561	PAM-6	0009	6/18/13	Air
249563	PAM-7	0010	6/18/13	Air
249557	PAM-1	0011	6/18/13	Blank

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
EMSL Project Number 011302880				
249694	1	0001	5/25/13	Air
249676	2	0002	5/25/13	Air
249697	3	0003	5/25/13	Air
249667	4	0004	5/25/13	Air
249664	5	0005	5/25/13	Air
249699	6	0006	5/25/13	Air
249665	7	0007	5/25/13	Air
249685	Field Blank 1	0008	5/25/13	Blank
EMSL Project Number 011302889				
249649	PAM-1	0001	6/2/13	Air
249645	PAM-2	0002	6/2/13	Air
249626	PAM-3	0003	6/2/13	Air
249606	PAM-4	0004	6/2/13	Air
249603	PAM-5	0005	6/2/13	Air
249639	PAM-6	0006	6/2/13	Air
249641	PAM-7	0007	6/2/13	Air
EMSL Project Number 011302890				
249569	OSAM-1	0001	6/20/13	Air
249589	OSAM-2	0002	6/20/13	Air
249576	OSAM-3	0003	6/20/13	Air
249582	PAM-1	0004	6/20/13	Air
249555	PAM-2	0005	6/20/13	Air
249579	PAM-3	0006	6/20/13	Air
249566	PAM-5	0008	6/20/13	Air
249551	PAM-6	0009	6/20/13	Air
249560	PAM-7	0010	6/20/13	Air
EMSL Project Number 011302902				
93945	OSAM-1	0001	6/21/13	Air
93982	OSAM-2	0002	6/21/13	Air
93989	OSAM-3	0003	6/21/13	Air
93974	PAM-1	0004	6/21/13	Air
93950	PAM-2	0005	6/21/13	Air
93968	PAM-3	0006	6/21/13	Air
93973	PAM-4	0007	6/21/13	Air
93966	PAM-5	0008	6/21/13	Air
93948	PAM-6	0009	6/21/13	Air
93958	PAM-7	0010	6/21/13	Air
93964	Media Blank 1	0011	6/21/13	Blank
93978	Field Blank 1	0012	6/21/13	Blank

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
EMSL Project Number 011302903				
93946	OSAM-1	0001	6/22/13	Air
93942	OSAM-2	0002	6/22/13	Air
93979	OSAM-3	0003	6/22/13	Air
93965	PAM-1	0004	6/22/13	Air
93953	PAM-2	0005	6/22/13	Air
93944	PAM-3	0006	6/22/13	Air
93943	PAM-4	0007	6/22/13	Air
93955	PAM-5	0008	6/22/13	Air
93976	PAM-6	0009	6/22/13	Air
93985	PAM-7	0010	6/22/13	Air
EMSL Project Number 011302949				
93980	OSAM-1	0001	6/23/13	Air
93987	OSAM-2	0002	6/23/13	Air
93988	PAM-1	0004	6/23/13	Air
93969	PAM-2	0005	6/23/13	Air
93954	PAM-3	0006	6/23/13	Air
93986	PAM-4	0007	6/23/13	Air
93961	PAM-5	0008	6/23/13	Air
93951	PAM-6	0009	6/23/13	Air
93947	PAM-7	0010	6/23/13	Air
EMSL Project Number 011303000				
93963	OSAM-1	0001	6/25/13	Air
93949	OSAM-3	0002	6/25/13	Air
93960	OSAM-4	0003	6/25/13	Air
EMSL Project Number 011303002				
93977	OSAM-1	0001	6/26/13	Air
93962	OSAM-3	0002	6/26/13	Air
93940	OSAM-4	0003	6/26/13	Air
EMSL Project Number 011303003				
93984	OSAM-1	0001	6/27/13	Air
93970	OSAM-3	0002	6/27/13	Air
93952	OSAM-4	0003	6/27/13	Air
EMSL Project Number 01130350				
93999	OSAM-1	0001	6/29/13	Air
94019	OSAM-2	0002	6/29/13	Air
94035	OSAM-3	0003	6/29/13	Air
94036	OSAM-4	0004	6/29/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011303052</i>				
93956	OSAM-1	0001	6/28/13	Air
93972	OSAM-2	0002	6/28/13	Air
93959	OSAM-3	0003	6/28/13	Air
93975	OSAM-4	0004	6/28/13	Air
<i>EMSL Project Number 011303053</i>				
94000	OSAM-1	0001	7/1/13	Blank
94012	OSAM-1	0002	7/1/13	Blank
94009	OSAM-1	0003	7/1/13	Air
94001	OSAM-2	0004	7/1/13	Air
93992	OSAM-3	0005	7/1/13	Air
94002	OSAM-4	0006	7/1/13	Air
<i>EMSL Project Number 011303054</i>				
93990	OSAM-1	0001	6/30/13	Air
94003	OSAM-2	0002	6/30/13	Air
94033	OSAM-3	0003	6/30/13	Air
94031	OSAM-4	0004	6/30/13	Air
<i>EMSL Project Number 011303111</i>				
94039	OSAM-1	0001	7/3/13	Air
94032	OSAM-2	0002	7/3/13	Air
94010	OSAM-4	0003	7/3/13	Air
<i>EMSL Project Number 011303112</i>				
94005	OSAM-1	0001	7/4/13	Air
94037	OSAM-2	0002	7/4/13	Air
94011	OSAM-3	0003	7/4/13	Air
94017	OSAM-4	0004	7/4/13	Air
<i>EMSL Project Number 011303113</i>				
93995	OSAM-1	0001	7/5/13	Air
94029	OSAM-2	0002	7/5/13	Air
94016	OSAM-3	0003	7/5/13	Air
94015	OSAM-4	0004	7/5/13	Air

Table 1-1 **Summary of Sampling Data Reviewed (continued)**
Hexavalent Chromium Analysis
Harbor Point - Area 1
Baltimore, Maryland

Sample Identification	Sample Location	Laboratory ID Number	Date Sampled	Matrix
<i>EMSL Project Number 011303114</i>				
94023	OSAM-1	0001	7/2/13	Air
94021	OSAM-2	0002	7/2/13	Air
94026	OSAM-3	0003	7/2/13	Air
94013	OSAM-4	0004	7/2/13	Air
<i>EMSL Project Number 011303224</i>				
93997	OSAM-1	0001	7/8/13	Air
94024	OSAM-2	0002	7/8/13	Air
94007	OSAM-3	0003	7/8/13	Air
94004	OSAM-4	0004	7/8/13	Air
<i>EMSL Project Number 011303225</i>				
94027	OSAM-1	0001	7/7/13	Air
94025	OSAM-2	0002	7/7/13	Air
94020	OSAM-3	0003	7/7/13	Air
94006	OSAM-4	0004	7/7/13	Air
<i>EMSL Project Number 011303226</i>				
93996	OSAM-1	0001	7/9/13	Air
94022	OSAM-2	0002	7/9/13	Air
94028	OSAM-3	0003	7/9/13	Air
93998	OSAM-4	0004	7/9/13	Air
<i>EMSL Project Number 011303227</i>				
94038	OSAM-1	0001	7/6/13	Air
94030	OSAM-2	0002	7/6/13	Air
94014	OSAM-3	0003	7/6/13	Air
93993	OSAM-4	0004	7/6/13	Air

The analysis of air samples and associated quality control samples for hexavalent chromium was performed by EMSL Analytical, Inc. (EMSL), of Cinnaminson, New Jersey. The samples were analyzed for hexavalent chromium according to the protocols specified in OSHA Method ID-215, Version 2, and EMSL Analytical SOP WC-058, Revision 2.

The findings presented in this report are based on a USEPA Region III Level IM1 review of the hexavalent chromium data for selected samples. The review was based on an evaluation of the following criteria, reported according to the CLP-equivalent deliverables format: chain of custody documentation, holding times, and Quality Control Summary Forms for laboratory method blanks, instrument calibration blanks, laboratory duplicate samples, laboratory control samples, and initial and continuing calibration standards.

The hexavalent chromium analyses were performed acceptably, but require qualifying statements. It is recommended that the analytical results be used only with the qualifying statements presented in this report. Any aspects of the data that are not qualified in this review should be considered quantitatively and qualitatively valid as reported, based on the criteria evaluated. Data summary tables presenting the qualified and/or validated results are included in Attachment 2.

2.1

DATA QUALIFIERS

- The samples summarized in the following table were analyzed for hexavalent chromium outside of the 30 day holding time specified in the air monitoring plan. Results for samples analyzed outside of the holding time may be lower than reported due to chemical degradation and/or loss of target analytes. The positive results or “non-detect” reporting limits for hexavalent chromium in the referenced samples have been qualified “J-” or “UJ”, respectively, to indicate that they are biased low quantitative estimates.

Samples Qualified for Holding Times

EMSL Project Number 011302079

249225 (PAM-1), 249241 (PAM-2), 249201 (PAM-3), 249235 (PAM-4),
249210 (PAM-5), 249204 (PAM-6), and 249200 (PAM-7).

Samples Qualified for Holding Times (continued)

EMSL Project Number 011302840

249698 (1), 249655 (2), 249666 (3), 249684 (4), 249651 (5),
249653 (6), and 249656 (7).

EMSL Project Number 011302841

249215 (PAM-2), 249249 (PAM-3), 249237 (PAM-6), and 249202 (PAM-7).

EMSL Project Number 011302880

249694 (1), 249676 (2), 249697 (3), 249667 (4), 249664 (5), 249699 (6),
249665 (7), and 249685 (Field Blank 1).

- Low concentrations of hexavalent chromium were detected in certain laboratory (instrument or preparation) blanks. Positive sample results in samples that were less than the action level of 10X the blank concentration were qualified "J+" and should be considered quantitative estimates that may be biased high. All samples qualified on the basis of laboratory blank contamination are summarized in the following table.

Samples Qualified for Laboratory Blank Contamination

EMSL Project Number 011301787

249448 (PAM-4), 249418 (PAM-1), 249435 (PAM-2), 249408 (PAM-3),
249437 (PAM-4), 249447 (PAM-6), 249446 (PAM-7), 249412 (PAM-1),
249401 (PAM-2), and 249406 (PAM-4).

EMSL Project Number 011302079

249341 (PAM-1), 249244 (PAM-5), 249246 (PAM-7), 249227 (PAM-1),
249220 (PAM-1), 249223 (PAM-2), 249234 (PAM-3), 249247 (PAM-4),
249206 (PAM-5), 249224 (PAM-6), 249218 (PAM-7), 249231 (PAM-1),
249245 (PAM-2), 249229 (PAM-3), 249205 (PAM-5), 249214 (PAM-6),
and 249216 (PAM-7).

EMSL Project Number 011302355

249683 (6) and 249695 (7).

EMSL Project Number 011302356

249610 (PAM-2), 249614 (PAM-3), 249612 (PAM-4), 249615 (PAM-5),
249631 (PAM-6), and 249602 (PAM-7).

EMSL Project Number 011302360

249662 (PAM-1), 249691 (PAM-2), 249677 (PAM-3), 249688 (PAM-4),
249679 (PAM-5), and 249672 (PAM-6).

EMSL Project Number 011302641

GTA-1 (PAM-1), GTA-2 (PAM-2), GTA-3 (PAM-4), and GTA-4 (PAM-6).

Samples Qualified for Laboratory Blank Contamination (continued)

EMSL Project Number 011302645

GTA-5 (PAM-1), GTA-6 (PAM-2), and GTA-7 (PAM-4).

EMSL Project Number 011302674

249459 (OSAM-1), 249577 (OSAM-2), 249591 (OSAM-3),
249480 (PAM-1), and 249593 (PAM-2).

EMSL Project Number 011302677

249501 (OSAM-3), 249487 (PAM-1), 249455 (PAM-2), 249496 (PAM-3),
249486 (PAM-4), and 249463 (PAM-5).

EMSL Project Number 011302876

GTA-25 (PAM-1), GTA-26 (PAM-2), GTA-27 (PAM-4), and GTA-28 (PAM-6).

EMSL Project Number 011302877

GTA-21 (PAM-1), GTA-22 (PAM-2), GTA-23 (PAM-4), and GTA-24 (PAM-6).

EMSL Project Number 011302878

GTA-29 (PAM-1), GTA-30 (PAM-2), GTA-31 (PAM-4), and GTA-32 (PAM-6).

EMSL Project Number 011302903

93953 (PAM-2), 93955 (PAM-5), 93976 (PAM-6), and 93985 (PAM-7).

EMSL Project Number 011303002

93977 (OSAM-1).

EMSL Project Number 011303111

94039 (OSAM-1) and 94032 (OSAM-2).

- Hexavalent chromium was detected in the media blank associated with EMSL project number 011301915. Positive results in samples reported in this project number that were less than the action level of 10X the media blank concentration were qualified “J+” and should be considered quantitative estimates that may be biased high. All samples that were qualified on the basis of the media blank contamination are summarized in the following table.

Samples Qualified for Media Blank Contamination

249439 (PAM-1), 249433 (PAM-2), 249443 (PAM-3), 249449 (PAM-4),
249422 (PAM-5), 249430 (PAM-6), 249440 (PAM-1), 249423 (PAM-2),
249402 (PAM-3), 249335 (PAM-5), 249337 (PAM-6), 249329 (PAM-1),
249313 (PAM-2), 249327 (PAM-3), 249344 (PAM-4), 249320 (PAM-5),
249326 (PAM-6), 249304 (PAM-1), 249323 (PAM-4), 249338 (PAM-5),
249318 (PAM-6), 249339 (PAM-7), 249317 (PAM-1), 249342 (PAM-2),
249343 (PAM-3), 249340 (PAM-4), and 249346 (PAM-5).

In general, the analyses were performed acceptably, but required several qualifying statements. This analytical quality assurance report has identified the aspects of the analytical data that have required qualifying statements. A support documentation package further detailing these findings has been prepared and is included with the Harbor Point project file.

Attachment 1
Methodology Summary and Method References

METHODOLOGY SUMMARY

Analysis for Hexavalent Chromium

Hexavalent chromium is extracted from the polyvinyl chloride filter using an aqueous solution containing 10% sodium carbonate/2% sodium bicarbonate and a mixture of phosphate buffer/magnesium sulfate. After dilution, an aliquot of this solution is analyzed for hexavalent chromium by an ion chromatograph equipped with a UV-Vis detector at 540-nm wavelength. A post-column derivatization of the hexavalent chromium with 1,5-diphenyl carbazide is performed prior to detection.

METHOD REFERENCES

<u>Title</u>	<u>Reference</u>
Hexavalent Chromium in Air by Ion Chromatography	EMSL Analytical SOP WC-058, Revision 2, April 2010.
Hexavalent Chromium	OSHA Method ID-215, Version 2 (T-ID215-FV-02-0604-M), April 2006.



EMSL Analytical SOP

Hexavalent Chromium in Air by Ion Chromatography OSHA ID-215 Modified

Effective Date: 4/21/2010

Revision History: Revision 0: 11/01/06 Bill Chamberlin
 Revision 1: 11/15/09 Julie Smith/Mike Mazur
 Revision 2: 4/21/2010 William Chamberlin

Laboratory Manager: _____

Julie Smith
Julie Smith

4/22/10
Date

(Or other approved signatory)

1.0 Scope and Application

1.1 Applicable Matrix

This procedure is a wet chemistry procedure for determining total (soluble and insoluble) Hexavalent chromium (CrVI) in air for samples from plating, welding and paint operations. This method is also applicable for the collection and analysis of total Hexavalent chromium in wipe samples (PVC filters). The samples may be collected on a 37-mm diameter polyvinyl chloride (PVC) filter (5.0 μ m pore size) with cellulose back-up pads (BUP) contained in a polystyrene cassette. The final determinative step is by Ion Chromatography.

Analyte	Collection Support Material	Method Reference	CAS No.
Hexavalent Chromium – Cr ^(VI)	37-mm diameter polyvinyl chloride (PVC) filter (5.0 μ m pore size)	OSHA ID - 215	18540-29-9 *

*Chemical Abstracts Service (CAS) Registry Numbers for Hexavalent Chromium Cr+6 analytes: 1189-85-1 (tert-butyl chromate); 1333-82-0 (chromium (VI) trioxide); 1344-38-3 (basic lead chromate orange); 7440-47-3 (chromium); 7758-97-6 (lead chromate); 7775-11-3 (sodium chromate); 7778-50-9 (potassium dichromate); 7784-01-2 (silver chromate); 7789-00-6 (potassium chromate); 7789-06-2 (strontium chromate); 7789-09-5 (ammonium dichromate); 7789-12-0 (sodium



dichromate dehydrate); 7789-98-9 (ammonium chromate); 10294-40-3 (barium chromate); 10588-

01-9 (sodium dichromate); 12656-85-8 (molybdenum orange); 13530-65-9 (zinc chromate); 13765-19-0 (calcium chromate); 14018-95-2 (zinc dichromate); 14986-48-2 (chromium (VI) chloride); 18454-12-1 (lead chromate oxide); 18540-29-9 (hexavalent chromium)

1.2 Detection Limit

The Standard curve range is 1 to 100 ug/L (0.01 ug to 0.1 ug per filter). The working range in ug.m3 is 0.01 µg/m3 to 1.0 µg/m3 for a 960-L air sample. The method measures the total concentration of airborne Hexavalent chromium. **The OSHA Permissible Exposure Limit (PEL) for this analyte (Cr+6) is 5.0 ug/ m3 for this analyte.**

2.0 Summary of Method

2.1 For samples from plating and welding operations, the filters are extracted (using an alkaline extraction solution) with hot 10% Na₂CO₃/2% NaHCO₃ (BE) and phosphate buffer magnesium sulfate (PBM) solutions (BE/PBM). The interior walls of sampling cassettes are wiped with a PVC filter wetted with a solution of 50% BE, 15% PBM, and 35% water (DBE) and are analyzed separately (filter and wipe). Samples from paint operations in addition to the extraction listed above, require a second extraction with hot 5% NaOH/7.5% Na₂CO₃ (SPE) and PBM solutions (SPE/PBM) following BE/PBM extraction **(Insoluble forms of Cr (VI) are not soluble in water but are soluble in warm basic solutions. The two extractions, BE/PBM followed by SPE/PBM, are necessary to break down the matrix of the paint to release the Cr^(VI) present and get it dissolved).** Finally, after dilution and settling for 4 hours (allows precipitation to settle) or filtration or centrifugation of extracts, the samples are analyzed by ion chromatography using UV-VIS detection at 540-nm following post-column derivatization with 1,5-diphenyl carbazide reagent.

3.0 Interferences

3.1 This method is specific for total Hexavalent chromium in the presence of trivalent chromium, therefore most heavy metals do not significantly interfere with detection. The sample hold times also reduce the potential of interferences (refer to sample collection and handling Section 7.0).

4.0 Definitions

4.1 **Reagent Water/DI Water** - Laboratory water that has been run through the filter and



deionized chamber process, and is known to be free of the method analyte.

- 4.2 **Method Blank** - (MB) For this method, a 37 mm PVC cassette is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, and internal standards that are used with other samples. The MB is used to determine if the method analyte or other interferences are present in the laboratory environment, reagents, or apparatus.
- 4.3 **Lab Control Sample (LCS)** - Laboratory Control Sample is the Quality Control Sample (QCS) for the batch. For this method a 37 mm PVC cassette is fortified with the analyte at a known concentration. The LCS reference source may be different from the source of the calibration standards. The LCS provides a check on the laboratory and method preparation performance.
- 4.4 **LCSD** - For this method a second 37 mm PVC cassette is fortified and prepared and analyzed separately through the entire preparation process. Analyses of LCSD provides a check for precision (repeatability) associated with laboratory procedures.
- 4.5 **IPC/ICV-Initial Performance Check / Initial Calibration Verification** - The IPC/ICV is a solution of method analyte, at a concentration of (Cr+6, 50 ppb), which is used to evaluate the performance of the instrument and to verify that the resulting calibration curve is correct or accurate. The IPC is the first QC standard run after the calibration. The IPC/ICV is a **second source standard** and is prepared from an external source; different from the one used for the calibration standards. The IPC is also used as a continuing calibration check standard and is analyzed after each 10 sample or sample dilutions analyzed.
- 4.6 **ICB- Initial Calibration Blank** - A Reagent blank prepared like a standard with no analyte added, used to check for instrument baseline drift and carryover contamination. Run after IPC/ICV. The ICB and the CCB are identical.
- 4.7 **CAL Check (60ppb)** The **CAL Check is standard used to confirm the calibration.** The **CAL Check** is prepared from the same source as calibration standards. For this method the CAL Check Standard is prepared at (Cr+6 60 ppb). The CAL Check Standard is analyzed at the beginning of the run following the IPC/ICV and the RL Standard.
- 4.8 **CCB- Initial Calibration Blank** - A Reagent blank prepared like a standard with no analyte added, used to check for instrument baseline drift and carryover contamination. Run after CAL Check Standard. The ICB and the CCB are identical.



4.9

RL – Reporting Limit Standard – A standard solution of the method analyte, prepared at the reporting limit concentration (Cr+6, 1.0 ppb), is used to evaluate the performance of the instrument and method and to verify reported concentrations. The RL is analyzed with each analytical run. The RL is compared to pre-determined acceptance limits. Initial acceptance limits are 50-150%.

4.10

RLVS – Reporting Limit Verification Spike – Minimum reporting limits are established initially by analyzing media spiked samples prepared at the desired reporting limit. For this method the RL verifications are prepared at (Cr+6, 1.0 ppb). Recovery results should be compared to acceptance criteria. Initial acceptance limits should be 50 to 150% recovery until sufficient data is available to establish limits. Ongoing limits are developed as the mean recovery +/- (3 times Standard deviation of the recoveries) of RL spiked media.

4.11

MDL - Method Detection Limit or Minimum Reporting MRL Verification - At least annually the laboratory will perform a Detection Limit (DL) study. The lab will perform an MDL or an MRL verification.

For the MRL analyze one or two spiked media (at or below the RL) and compare the recovery to acceptance limits. Initial limits should be 50 to 150% until sufficient data is available to establish limits. Establish the limits as the mean recovery +/- (3 times Standard deviation of the recoveries) of RL spiked media.

For an MDL study, prepare and analyze at least 7 replicates media spikes prepared by spiking media at a concentration equal to or below the reporting limit and carrying the spikes through the extraction and analysis procedure. To calculate the MDL – determine the standard deviation of the 7 replicates in concentration units (mg/ug/media) and multiply the Standard deviation result by the Student T value for 7 replicates (3.14). **For the MDL study to be valid, the following must be true: 10 X the MDL > Spike concentration > MDL concentration found**

5.0 **Safety**

5.1

Certain Cr(VI) compounds are known animal and/or human carcinogens. Chromic acid and its salts have a corrosive action on the skin and mucous membranes.

5.2

Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable.



- 5.3 Prepare all phases of the extraction and extract handling should be done in a fume hood.
- 5.4 Always wear safety glasses or a shield for eye protection, protective clothing and protective acid resistant gloves when performing this method. Analysts performing this method should be familiar with the EMSL Safety SOP and the precautions stated in the EPA methodology,
- 5.5 MSDS's for all chemicals are available for use by employees.

6.0 Equipment and Supplies

- 6.1 37-mm diameter polyvinyl chloride (PVC) filter (5.0 μ m pore size) with cellulose back-up pads (BUP) contained in a polystyrene cassette. SKC P/N 225-8-01-1 or equivalent
- 6.2 Ion chromatograph, Dionex ICS 1000 with suppressor, UV- Absorbance detector, with PC based integration and report software (Dionex/Chromeleon).
- 6.3 Eppendorff Pipettor and pipette tips
- 6.4 Pipettes, volumetric 0.1-, 0.5-, 1.0-, 2.0-, 10.0-mL
- 6.5 Vials, glass or plastic, 1.5-mL with PTFE-lined caps Dionex P/N 055427
- 6.6 Flasks, volumetric (Class A) , 10, 25-, 50-, 100-mL, with stoppers
- 6.7 Plastic Forceps
- 6.8 Centrifuge tubes 50 ml w/ screw caps VWR Cat # 82018-050
- 6.9 BD 3-ml disposable syringes w/ Luer-Lok Tips VWR P/N 309585
- 6.10 PTFE 1.0 μ m disposable filters VWR P/N

7.0 Reagents and Standards

- 7.1 Potassium dichromate [CAS no. 7778-50-9] Primary Source Standard:
1000 mg/L Hexavalent Chromium Standard NIST Traceable, Absolute Standards, Inc P/N 54161 or equivalent.
- 7.2 Potassium dichromate [CAS no. 7778-50-9] Second Source Standard:
100mg/L Hexavalent Chromium Standard NIST Traceable, VHG Labs Inc., SPCR6-100 or equivalent

Note: To Prepare Standard Stocks from neat materials (instead of purchasing prepared stock standards)

at a concentration of about 100 μ g/mL of Cr (VI). Prepare by dissolving 0.2828 g of $K_2Cr_2O_7$ in 1.000 L of DI water. (For example: the calculation for a stock standard is: $(0.2828 \text{ g } K_2Cr_2O_7/\text{liter}) \times (1000 \text{ mg/g}) \times (1000 \text{ } \mu\text{g/mg}) \times (L/1000 \text{ mL}) \times (MW \text{ Cr}/MW \text{ } K_2Cr_2O_7 = 51.996/294.18) \times (2 \text{ moles of Cr in } K_2Cr_2O_7) = 100 \text{ } \mu\text{g/mL Cr (VI).}$) Prepare this solution every 3 months. Make all dilutions of the stock



standard with DBE/PBM solution in order to matrix match standards with samples. The working range for analytical standards is 0.3 to 200 ng/mL. Prepare these diluted analytical standards weekly.

- 7.3 DI Water: Water shall be interference free – filtered through 0.45- μ m membrane filter.
- 7.4 Sulfuric acid [CAS no. 7664-93-9], concentrated.
- 7.5 Nitric acid [CAS no. 7697-37-2], concentrated (69-70%).
- 7.6 Sodium bicarbonate - NaHCO_3 , [CAS no. 144-55-8], reagent grade.
- 7.7 Sodium carbonate - Na_2CO_3 , [CAS no. 497-19-8], reagent grade.
- 7.8 Sodium hydroxide [CAS no. 1310-73-2], reagent grade.
- 7.9 Potassium dihydrogen phosphate [CAS no. 7778-77-0], reagent grade.
- 7.10 Potassium hydrogen phosphate trihydrate [CAS no. 16788-57-1], reagent grade.
- 7.11 Magnesium sulfate [CAS no. 7487-88-9], anhydrous, reagent grade.
- 7.12 Ammonium sulfate [CAS no. 7783-20-2], reagent grade.
- 7.13 Ammonium hydroxide [Cas no. 1336-21-6], 29% solution.
- 7.14 1,5-Diphenylcarbazide (DPC) [CAS no. 140-22-7], reagent grade.
- 7.15 Methyl alcohol CH_3OH [CAS no. 67-56-1], HPLC grade.
- 7.16 Buffer/extraction **(BE) solution** (10% NaHCO_3 + 2% Na_2CO_3): Add 20 g NaHCO_3 in about 500 ml DI H_2O contained in a 1.0-L volumetric flask. Then add 100 g of Na_2CO_3 , swirl to dissolve and then dilute up to the mark with DI water. A Teflon®-coated magnetic stirring bar and stirrer will facilitate dissolution. Remove and rinse the stirring bar, adding the rinses to the volumetric flask, and then dilute to the mark with E-Pure DI water. Prepare monthly.
- 7.17 Spray-paint extraction **(SPE) solution** (5% NaOH + 7.5% Na_2CO_3): Dissolve 50 g NaOH and 75 g Na_2CO_3 in about 500 ml E-Pure DI water contained in a 1.0-L volumetric flask. A Teflon®-coated magnetic stirring bar and stirrer will facilitate dissolution. Remove and rinse the stirring bar, adding the rinses to the volumetric flask, allow the solution to cool to room temperature, and then dilute to the mark with E-Pure DI water. Use this solution only for extraction of samples taken to assess exposure during spray-paint operations. Prepare monthly.
- 7.18 Magnesium sulfate solution [~ 10 mg/ml as Mg(II)]: Dissolve 49.50 g of anhydrous MgSO_4 in 500-mL volumetric flask containing 100 ml E-Pure DI water. Mix well and dilute to the mark with E-Pure DI water. Prepare monthly.



- 7.19 Phosphate buffer Solution (0.5 M KH_2PO_4 /0.5 M $\text{K}_2\text{HPO}_4 \cdot 3\text{H}_2\text{O}$): Dissolve **68.0 g** of KH_2PO_4 and 114.1 g of $\text{K}_2\text{HPO}_4 \cdot 3\text{H}_2\text{O}$ in 1000-mL volumetric flask containing 500 ml E-Pure DI water. Mix well and dilute to the mark with E-Pure DI water. Prepare monthly.
- 7.20 Phosphate buffer/Mg(II) (**PBM**) solution: Measure 25 ml of the magnesium sulfate solution (7.18) into a 100-mL beaker containing 50 ml of phosphate buffer (7.18). Mix well (Note: Do not dilute with DI H_2O). Prepare just before each analysis. Test by adding 1 ml to 5 ml of Buffer Extraction solution. A white precipitate should form making a "milky" solution. This solution is stable for 4 hours.
- 7.21 Dilute Buffer Extraction/Phosphate buffer/Mg(II) or **DBE/PBM** solution: Pipette 50 ml of the **BE (7.16)** solution into a 100-mL volumetric flask containing 15 ml of **PBM (7.20)** solution. Mix well and dilute to the mark with E-Pure DI water. Magnesium hydroxide will form and precipitate out of solution. Allow the precipitation to settle for at least 60 min., or place in a centrifuge at 3,200 rpm for 10 min. Transfer the "clear" solution to a beaker. Prepare this solution just before working standard preparation. Caution precipitate as it will clog the IC Autosampler injector.
- 7.22 Eluant [250 mM $(\text{NH}_4)_2\text{SO}_4$ + 100 mM NH_4OH]: Place about 500 ml of DI water in a 1-L volumetric flask, add 13.0 ml of 29% ammonium hydroxide NH_4OH , then add 66.0 g of ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ and mix well. Dilute to the mark with DI water. Mix well and dilute with E-Pure DI water to 2.0 L in a volumetric flask. Transfer the solution to the eluant container and degas under vacuum for 5-10 min.
- 7.23 Post column derivatization reagent (2.0 mM DPC in 90:10 1 N H_2SO_4 :methyl alcohol):
Step 1): First dissolve 0.5 g of DPC (**7.14**) in 100 ml of HPLC grade methanol CH_3OH .
Step 2): Second, add 28 ml of 98% H_2SO_4 to about 500 ml of E-Pure DI water (CAUTION !!! Make additions very, very slowly, with mixing) Allow to cool to room temperature before going to the next step.
Step 3): When the sulfuric acid solution has cooled to room temperature, Mix solutions (Step 1) and (Step 2) together carefully and dilute, with stirring, in a 1-L volumetric flask with E-Pure DI water. Cool solution to room temperature (Caution: the reaction of the DPC with Cr(VI) will be incomplete if this solution is warm). Transfer the solution to the 1-L polyethylene bottle located in the pressurized reagent reservoir. The solution is stable for up to 5 days but should only be prepared as it is needed for use, 1.0 L at a time. The sensitivity of the method is dependent on the freshness of the DPC solution.



8.0 Sample Collection, Preservation, Shipment and Storage

- 8.1 All samples should be submitted with at least one media blank PVC filter cassette. For results to be reported in m^3 , the air volume in Liters (L) must be provided. Without air volume results are reported in ug/filter .
- 8.2 Cr (VI) samples from chromium plating operations collected on PVC filters must either be analyzed within 6 days of sampling or be stabilized as described in Section 8.2.1. At receipt in the laboratory, filters are stored in the refrigerator at 2-6 °C.
- 8.2.1 Samples are stabilized by removing the filters from the cassettes and placing them in labeled glass vials each containing 5.0 ml of BE solution. Acids from chromium plating operations are neutralized by BE solution, and stabilization allows samples to be stored for up to two weeks before analysis. The interior walls of sampling cassettes should be wiped with a PVC filter that has been wetted with 1 drop of dilute BE/PBM, and then also stabilized by placing it into separate labeled vials containing 5.0 ml of BE.

Note: NaOH coated quartz filters are an alternative sampling medium for chromium plating samples. Specific information will not be given in this SOP for preparation and use of this type of filter. Refer to the method for details on purchase or preparation. Media blanks and spikes will need to be analyzed to validate this type of sampling.

- 8.3 Cr (VI) samples collected on PVC filters from welding operations must be analyzed within 8 days of sampling. At receipt in the laboratory, filters are stored in the refrigerator at 2-6 °C.
- 8.4 Sampling Instructions (Recommendations for the Client): The sampling rate for the collection of an air sample for CrVI is recommended at 2.0 L / minute. Collect a total sample size of approx. 960 L.

9.0 Calibration

- 9.1 Calibrate daily with working standards over the range 0.001 to 0.100 mg/L. A calibration curve may also be prepared “quarterly” and daily, the calibration curve can be verified using a Continuing Calibration Check Standard. Prepare at least 5 calibration standards.
- 9.2 Prepare a working 10.0 mg/L standard solution, by adding 12.5 ml Buffer Extraction solution to a 25 ml volumetric flask, pipette 2.5 ml of 100.0 mg/L calibration stock solution and bring to final volume with E-pure DI water.
- 9.3 Prepare a working 1.0 mg/L standard solution, by adding 12.5 ml Buffer Extraction



solution to a 25 ml volumetric flask, pipette 0.25 ml of 100.0 mg/L calibration stock solution and bring to final volume with E-pure DI water.

9.4 Prepare a working 10.0 mg/L IPC (ICV) standard solution, by adding 12.5 ml Buffer Extraction solution to a 25 ml volumetric flask, pipette 0.25 ml of 1000.0 mg/L calibration stock solution and bring to final volume with E-pure DI water.

9.5 Analyze together with field samples QC samples and blanks.

The **Calibration Curve** concentrations for this procedure are the following:

Analyte	STD 1 (ug/L) 10 ml of 1.0 mg/L /10 ml of DBE/PBM	STD 2 (ug/L) 1 ml of 1.0 mg/L /10 ml of DBE/PBM	STD 3 (ug/L) 20 ul of 10.0 mg/L /10 ml of DBE/PBM	STD 4 (ug/L) 60 ul of 10.0 mg/L /10 ml of DBE/PBM	STD 5 (ug/L) 100 ul of 10.0 mg/L /10ml of DBE/PBM
CrVI	1.0 ug/L	10.0 ug/L	20.0 ug/L	60.0 ug/L	100.0 ug/L

9.6 The following standards and QC Standards are analyzed at the stated concentrations:

RL Standard – 1.0 ug/L

IPC/ICV – 50.0 ug/L secondary source (also used as a continuing calibration standard analyzed after each 10 samples or sample dilutions.

LCS/LCSD – 50.0 ug/L (based on Final volume of Digest)

CAL Check – 60.0 ug/L

ICB/CCB - 0.0 ug/L

Note: Refer to Section (19.3) for an Example Analytical Sequence Order for ID-215.

9.7 **Calibration Curve Analysis requirements:** The results for the calibration standards are used to prepare a calibration curve for the analyte. At least 5 standard concentrations should be used. A linear calibration curve is being used for this method. A blank standard (0.0) must be included in the calibration curve. The coefficient of variation or R^2 must be 0.990 or greater. The curve should not be set with the y intercept at $y=0$. 2nd and 3rd order equation should not be used. If a 2nd and 3rd order equation is required, look for the source of the problem.

Note: An average calibration factor may be used for this method. In this case, the % RSD of the calibration factors for the 5 standards must be < or equal to 20% to assume



linearity so that the average calibration factor (CF or RF) can be used in place of a calibration curve.

9.7.1 A new calibration curve is prepared and analyzed at least once per quarter (90 days). The working calibration curve then, can be used for the 90 days following the preparation as long as the continuing calibration check standards results are acceptable. If not acceptable a new calibration curve must be prepared.

9.7.1.1 Initial Calibration Curve verification: Immediately following the calibration curve, an IPC/ICV (second source) standard is analyzed. The Acceptance limits for the IPC/ICV (second source) is 90 to 110% of the concentration of the standard. The Initial Calibration curve is validated or verified if the acceptance limits are met

9.7.1.2 If using the “initial calibration curve” -- ongoing – (during the 90 days that the curve is valid), daily, the calibration curve must be validated, by analyzing a “IPC/ICV” (second source) standard at the start of the daily run. For the “initial calibration curve to be valid, the results for this initial “daily” “IPC/ICV” must be within 90 to 110%. If not, a new calibration curve must be prepared.

10.0 Procedure

10.1 For Air Sample batches: Record all information in the Hexavalent Chromium (CrVI) by IC logbook. Record all pertinent information.

10.2 Determine (using the LIMS system) the number of samples for the batch. Retrieve the samples to be tested using in-house procedures (Refer to the QA Manual and Internal Chain of Custody SOPs for details).

10.3 Sample Preparation:

10.3.1 Adjust the hot block to a temperature below the boiling point of the BE solution. A plate surface temperature near 105°C is adequate for extraction.

10.3.2 Set up and label hot block tubes for MB, LCS and LCSD. Label two tubes for each sample to be analyzed (the first labeled “F” and the second labeled “C”).

10.3.3 Carefully remove each PVC filter from their cassettes, place them face-down in the designated “F” hot block tube, add 1.5 ml of PBM solution, mix well,



and finally add 5.0 ml of BE solution.

Note: Always add PBM solution before adding the extraction solution. The freshly precipitated magnesium hydroxide [10 mg of Mg(II)] formed suppresses the oxidation of dissolved Cr(III) to Cr(VI).

10.3.4 Add 1-2 drops of DBE/PBM solution to the cassette and wipe the cassette with a new PVC filter and place in the designated "C" hot block tube, add 1.5 ml of PBM solution, mix well, and finally add 5.0 ml of BE solution.

10.3.5 Swirl tubes gently until a white precipitate occurs and digest on the hot block for 1 hour for welding/plating operations and 90 min for painting operations.

Note: DO NOT ALLOW ANY SOLUTIONS TO BOIL OR EVAPORATE TO DRYNESS, ADD DI WATER IF NEEDED. Conversion of Cr(VI) to Cr(III) can occur from excess heat causing loss of sample.

10.3.6 Allow the solutions to cool to room temperature and dilute to 10.0 ml volume with E-pure DI water. Cap and shake each tube to bring into uniform solution.

10.3.7 **Secondary Extraction for painting samples:**

10.3.7.1 Remove the filters and wipes for each sample and extract a second time with 1.5 ml PBM and 5.0 ml of SPE solution.

10.3.7.1 Digest for additional 90 min

10.3.7.2 Allow solutions to cool and combine with original extraction. Dilute to a final volume of 25.0 ml with E-Pure DI water. Cap and shake each tube to bring into uniform solution.

10.3.8 Centrifuge all samples at 2,000 - 2,500 rpm for 10 min.

10.3.9 Quantitatively transfer the clear solution to auto sampler vials and analyze using the IC.

11.0 **Calculations and Reporting**

11.1 Calculate concentration, C, of CrVI in the air volume sampled, V (L):

$$C = \frac{(W_f + W_b)}{V} * 1000, \quad \text{ug/m}^3$$

Note: Blank correction in this calculation involves the batch method blank. Results for samples are *not* field-blank corrected.

W_f = ug Filter Section (combined amount for the cassette filter and the "cassette wipe



filter”). See Note: below.

W_b = ug Wipe Section

V = L Sampled

Note: For this method a second extraction aliquot is prepared from the wiping out of the Cassette filter holder using a new PVC filter. This second extraction aliquot “ug” amount is calculated using the same formula in 11.1. This ug amount is added to the result for the Cassette filter for the final calculation to ug/m3 and the sum of the two results. Refer to the excel spreadsheet copy, Section 19.2 of this SOP. The spreadsheet allows for the individual calculation of each fraction and the summing of the two ug/filter amount's

12.0 Method performance

12.1 Method Detection Limits (MDL)/Minimum Reporting Limits (MRL):

Initially and then annually, or whenever there is a change in methodology or instrumentation, an MDL/MRL must be established using reagent water (blank) and solid support material fortified at a concentration at or below the reporting limit. To determine MDL/MRL value, analyze at least three replicates to satisfy (MRL) requirements and at least seven replicates for the MDL requirements. Analyze all fortified solid support samples by processing the samples through entire analytical procedure. Perform all calculations as defined in method and report concentration values in the appropriate units.

If an MDL is analyzed, the MDL is calculated as follows:

$$MDL = t \cdot S$$

Where,

t = Student's t value for a 99% confidence level and a standard deviation estimate with $n-1$ degrees of freedom. ($t = 3.14$ for seven replicates).

S = standard deviation of the replicate analyses

For the MDL study to be valid, the following must be true:

10 X the MDL > Spike concentration > MDL concentration found

If an MRL is analyzed, the MRL is evaluated based upon the percent recovery of the analyzed replicates. The percent recovery must meet predetermined acceptance limits. Initially, the acceptance limits are 50 – 150%. Recovery limits are established through the analysis of low level media spikes just as for LCS. See Supervisor or Quality Assurance



Manager for current acceptable recovery limits. Current acceptable recovery limits should be placed in the corresponding master calculation sheet or should be immediately available.

12.2 Demonstrations of Capability (DOCs)

Initially and then every six months (6), each analyst must prepare and analyze at least four aliquots of a specified standard concentration (LCS). For a work cell - for ongoing DOCs, where an IDOC exists for each analyst, the lab may collect the last four LCSs from the work cell and produce a DOC.

12.3 DEMONSTRATION OF COMPETENCY - For Analytes not covered by a PT program, where no PT for purchase exists, the laboratory must identify at least one method from within the FOT and perform the procedures to be outlined in this section of the SOP to demonstrate competency. The following analyte/methods have been identified for this procedure for Chemistry:

1) FOT - IH-AA, Mercury (Hg) by method NIOSH 6009,

2) **FOT - IH-IC, Hexavalent Chromium (Cr6+) by method OSHA ID-215,**

3) FOT - IH-UV/VIS, Cyanide (CN) by method NIOSH 6010.

12.3.1 AIHA Policy: The AIHA requirement includes the following (6B.3 & 6B.3.3):

6B.3 DEMONSTRATION OF COMPETENCY For FOT's not covered by AIHA PAT Programs, LLC samples, the laboratory shall demonstrate competency for a minimum of one (1) method per FOT through the implementation of one (1) of the following three (3) alternatives.

6B.3.3 The laboratory shall implement a comprehensive internal QC program for at least one method in the FOT. A minimum of twenty (20) QC data points shall be obtained initially to determine upper and lower control limits at three (3) standard deviations. At least twice annually, the laboratory shall prepare a minimum of four independently prepared blind spikes at varying levels with the resulting data treated as it would be in a round robin program. The spiking procedures, to include frequency, responsibility for implementation, statistical treatment of resultant data, acceptance criteria, and actions to be taken in the event of an unacceptable result, shall be fully described in the laboratory's management system documentation.



12.3.2

EMSL DEMONSTRATION OF COMPETENCY Procedure:

The comprehensive program for the IH-AA, IH-IC, and IH-UV/Vis methods will include the following:

- 1) To demonstrate competency, the laboratory will analyze at a minimum 20 data points (LCS – Solid Support recoveries) for each method. The laboratory will collect the Recovery and RPD (LCS and LCSD's) data from ongoing analyses. The laboratory will perform statistical calculations to develop the acceptance limits for ongoing LCS/LCSD data. The acceptance limits for "Recovery" will be based on 2 and 3 standard deviation from the mean recovery of the LCSs. The acceptance limits for the RPD data will be determined at 2.51 times the AVG RPD and 3.27 times the AVG RPD. The mean and standard deviations will be determined using Excel programs developed by EMSL or the data will be generated using EMSL Analytical, Inc.'s LIMS. Control charts will be produced for the % Recovery of the LCS's and RPD of the LCSD's. The ongoing data recovery and LCS and LCSD's will be charted in real time and monitored for trends against the determined limits.
- 2) Additionally, to demonstrate competency, the program will include performing a "Blind" PT set of four (4) samples (at varied concentrations) approximately every 6 months. The Blind spikes will be prepared "blind" to the analyst. The Blind spikes will be prepared in the normal concentration range found in samples. Acceptance limits will be based on the LCS control limits developed (2 and 3 Standard deviations from the mean) using LCS and LCSD data from ongoing QC for that analyte/method.

The blind spikes will be prepared by William Chamberlin, QA Director or a designated QA Assistant. The Blind PT study will be logged into the LIMS as a real sample set (listed as Blind PT study (by date and analyte (method))). The study will have a formal close date set at the time of login (usually 3 weeks). The following is a summary - scenario of the PT study process:

- a) The PT study will be logged into the EMSL LIMS as real samples listed as "Blind PT Study" by William Chamberlin (QA Director) or by a QA Designate.
- b) The analyst and the QA Director or QA Designate pre-negotiate



the day and the time that the PT study will begin. With day and time set, the analyst, when they are ready to begin the study, will set up or prepare 4-LCS solid support digestion or extraction tubes (e.g., Hot Block™ Tube) as appropriate for the analyte/method. The digestion or extraction tubes containing solid support are set-up or prepared for the 4 PT samples. The tubes are capped or covered and set aside. The analyst, next, will setup and prepare the batch blanks, the batch QC spikes (LCS/LSCD) and any other samples for the batch.

- c) Next, when the batch setup is completed and the analyst is ready to proceed with the digestion or extraction, the analyst will contact William Chamberlin (or designate) who will come to the lab and prepare the (4) PT Blind Spikes by spiking varying amounts of the LCS spike solution (prepared by the analyst) into each of the 4 LCS solid support samples. The spike concentration amounts will be made (blind to the analyst). The analyst will be asked to leave the area during the spiking of the PT samples. Only, William Chamberlin or the designate will know the actual spiking amounts. The spiking amounts will be predetermined and pre-recorded by William Chamberlin on a "PT Spike Form". At the time of the spiking, the actual spike amounts will be verified on the form by initially the amounts.
- d) Immediately, following the spike preparation, to ensure the accuracy of the spike amount prepared, William Chamberlin or designate will test the Eppendorff pipette spiking accuracy. Using DI water, the Eppendorff pipette will be checked by pipetting identical amounts of DI water Vs amounts of spike solution added to each PT into a tared weigh boat on a balance. The resulting weights are compared to volumes used. The weights are recorded to the nearest 0.0001 g on the "PT Spike Form". Once the spiking and spike amount checks are completed the analyst is notified to begin the extraction and analysis procedure.



- e) When the results for the study are completed by the analyst, the analyst will enter the values into the LIMS as they would for real samples (in ug/tube, or ug/filter as appropriate). William Chamberlin will grade the results reported for the samples as compared to the actual concentrations spiked. A report is generated by William Chamberlin summarizing the results compared to the acceptance values. Acceptance limits will be based on the EMSL Method Acceptance limits generated using ongoing LCS/LCSD data.
- f) Evaluation scores will be reported to the analyst through the Laboratory Director. Copies of results for all PT studies are maintained by the QA Department. Results and data from these analyses are maintained for at least 5 years.
- g) The analyst must pass at least 3 out of the 4 PT samples tried. The laboratory must remain at least 75% proficient for all PTs tried.
- h) If results are not acceptable for any of the samples tried, a corrective action investigation will follow initiated by the QA Director. The analyst or department Supervisor will summarize any findings of the investigation in a written response to QA including a corrective action plan. The response should be included in an EMSL CAR form.
- i) The QA Director and the Laboratory Director, if satisfied with the corrective action plan may require no further action. The QA Director can also require additional Blind PTs to be analyzed (before the next regularly scheduled PT study) to ensure that the method is under control.
- j) Every ~six months the study will be repeated. If multiple analysts perform an analyte/method, the laboratory will ensure that each analyst is tested using these PTs at least every other year.
- k) At a minimum, the laboratory must perform two studies per year for each of the three FOTs listed. At a minimum, the two studies must be at least two weeks apart by AIHA rules. The current PT



study schedule is December/January and June/July (approximately every 6 months).

12.4 Desorption Efficiency: The method does not specifically specify performing a D.E. for the PVC filters. The method lists – “The mean extraction efficiency for soluble Cr (VI) from PVC filters over the range of RQL to 2 times the target concentration (3 to 1920 ng per sample) extracted with BE/PBM was 97.2%. The extraction efficiency was not affected by the presence of water (mean recovery of 97.1%). The mean extraction efficiency for insoluble Cr (VI) from PVC filters over the range of RQL to 2 times the target concentration (3 to 1920 ng per sample) extracted with BE/PBM was 97.7%. The extraction efficiency was not affected by the presence of water (mean recovery of 98.1%)”. The extraction efficiency of this method will be determine with each batch through the use of LCS and LCSD spike media.

13.0 Quality Control

13.1 In addition to the procedures, polices and calculations for the analysis of quality control samples, this section must also include acceptance criteria and contingencies for handling and corrective actions for out-of – control data.

13.2 When a batch is started, the batch QC will include a Method Blank, and an LCS and LCSD. The batch can include up to twenty samples but must not exceed thirty days; however, each day an analysis is performed, the daily QC must include a Method Blank and an LCS, LCSD. The batch can include up to twenty samples but must not exceed thirty days.

13.3 Method Blank – The laboratory must analyze at least one Method Blank with each batch. Values that exceed the MDL (11.1.1) indicate laboratory or reagent contamination should be suspected. Corrective actions must be taken before continuing the analysis.

Blank preparation- For each group of samples processed, preparation blanks (matrix, DI water, and reagents) shall be carried throughout the entire sample preparation and analytical process. The absolute value of the concentration analyte in the blank should be less than or equal to the MDL, it is considered to be acceptable if it is not more than 10% of the regulatory limit or limit of concern. *Note: at least 1 blank per 20 samples must be analyzed.*

13.4 Laboratory Control Sample (LCS(D)) – The laboratory must analyze an LCS and LCSD with each batch. If the recovery of any analyte falls out of control, and the source of the



problem should be identified and resolved before continuing analyses. Repeat batches where LCS failures exist.

NOTE: If the results for the LCS and LCSD fall outside the control limits of (initial limits 80-120%, or current ongoing LCS/LCSD established acceptance limits) it must be reported on the client reports for that batch.

LCS preparation - Prepare two (2) blank solid support cassette filters. Prior to analysis, spike each solid support cassette with a predetermined, known amount of a 2nd source CrVI standard. Recommended spike concentration would be equivalent to the low level standard, and 2-4x higher. Check with laboratory supervisor.

13.5 Calculate the LCS recovery:

$$\% \text{ Recovery} = \frac{C_{\text{LCS}}}{C_{\text{True}}} \times 100\%$$

Where,

$$\begin{aligned} C_{\text{LCS}} &= \text{Concentration of LCS (mg/L)} \\ C_{\text{True}} &= \text{True Concentration LCS (mg/L)} \end{aligned}$$

13.6 If LCS outside of limits, reanalyze LCS; if still does not pass, reject and reanalyze batch.

13.7 If the sample is out of range and reanalysis is not possible, reported data is flagged to indicate out of control condition.

13.8 Calculate the RPD of LCS and LCSD:

$$\text{RPD} = \frac{|\text{Sample (mg/L)} - \text{Sample Duplicate (ug or mg)}|}{(\text{Average of LCS and LCSD}) (\text{ug or mg})} \times 100$$

Where | | = Absolute value.

13.9 RL Standard: Each day, analyze an RL standard. Analyze a concentration equivalent to the lowest standard analyzed. The RL standard should be analyzed following IPC/ICV and it should be preceded by the analysis of a Calibration Blank. The RL standard acceptance limits initially are 50-150%. Determine ongoing acceptance limits using data from analysis as for LCSs (14.3).

13.10 RLVS – Reporting Verification Spike – Minimum reporting limits are established initially by analyzing media spiked samples prepared at the desired reporting limit. For this method the RL verifications are prepared at (Cr+6, 1.0 ppb). The RL Verification Spikes are analyzed initially and at least annually to verify the reporting limit. The RL Verification spikes are compared to pre-determined acceptance limits. At least annually or sooner if changes in the method occur, that effect the sensitivity, the



performance at the minimum reporting limit of the method will be re-established through the analysis of media spiked samples prepared at or below the minimum reporting limit. Sample spikes are taken through the entire procedure and the results are compared to predetermined limits.

Initially, the acceptance limits for RL Verification Spikes are 50 - 150%. Limits are established as ± 3 times the standard deviation of a set of data points (ongoing RL LCS media spiked results).

14.0 Data Assessment and Acceptance Criteria for Quality Control Measures

- 14.1 Method Blank analysis should not exceed the lowest standard analyzed concentration. Method Blank concentration should not exceed 10 % of the regulatory concentration of concern.
- 14.2 Acceptable Recovery limits for IPC/ICV – 90-110% (second source)
- 14.3 Acceptable Recovery limits for CAL Check – 90-110%
- 14.4 Acceptable Recovery limits for IPC/ICV – 80-120% (When used as a Continuing Calibration Standard between groups of Sample analyses).
- 14.5 LCS recovery acceptance limits are set at 70-130% initially and are updated based on ongoing LCS recoveries. The limits will be based on the mean recovery ± 3 standard deviations as the Control Limits and ± 2 standard deviations as the Warning Limits. No results should exceed the Control limits. Since limits are revised periodically, the limits will not be presented here. The limits will be updated on the Current Excel Spreadsheet for the method. This updated version of the spreadsheet will be found in the Network Drive L:/Calculations Master New subdirectory.
- 14.6 Duplicate recovery data (LCS and LCSD recovery data) will be evaluated using a maximum of 20% RPD as the acceptance limit. RPD limits are determined from ongoing data and are based on: Warning Limits (2.51 x Average RPD), Control Limits (3.27 x Average RPD) as percent.
- 14.7 RL Standard: Initially, the acceptance limits for RL Standard are 50 - 150%. Ongoing Limits are established as ± 3 times the standard deviation of a set of data points (ongoing RL Standard results).

15.0 Corrective Actions for Out-of-Control Data



15.1

If control data falls out of the acceptance range, the analyst will notify the supervisor. Each time this happens the analyst/supervisor must determine the cause. If the results for the LCS are not acceptable the results for sample can not be reported. The entire batch of samples and QC must be re-run and if still not acceptable, re-prepped and rerun. If the samples can not be re-prepped (wipes, cassettes) the results to each client will be annotated to indicate the LCS failure.

16.0

Contingencies for Handling Out-of-Control or Unacceptable Data

16.1

If control data falls out of the acceptance range, the analyst will notify the supervisor immediately. When LCS failure occurs, the analyst/supervisor must determine the cause of the failure through a corrective action investigation. If the results for the LCS are not acceptable the results for sample can not be reported. The entire batch of samples and QC must be re-run and if still not acceptable, re-prepped and rerun. If the samples can not be re-prepped (wipes, cassettes) the results to each client will be annotated to indicate the LCS failure. Supervisors will notify QA and the Laboratory Director when there is a LCS failure and the cause can not be determined. If successive QC failures occur, the QA Manager will determine if close monitoring of QC performance and oversight of the operations is required. The oversight will continue until evidence of improved performance is demonstrated.

16.2

Effect of QC failure or other Nonconformities/Stop Work

- ♦ Evaluate the acceptability of the nonconforming work (is it suitable for use?)
- ♦ Notify the customer (when necessary)
- ♦ Determine what corrective actions are needed
- ♦ Stop the work (when necessary)
- ♦ Determine what is required to resume work (if work is stopped)

A stop work order may be given where a breach in the quality system jeopardizes analytical quality or a failure in procedures presents an eminent safety concern. Any EMSL employee is authorized to stop work. The Lab Manager, Quality Assurance Manager are the only EMSL employees authorized to provide the directive to resume work.

16.3

Root Cause and Corrective Actions

All QC sample failures must be handled in a manner which will provide a way to help ensure the deficiency is not repeated. This includes identification of the root cause of the



error, the reason why it occurred and the initiation of a corrective action. The corrective action will consist of a review of all steps leading up to the non-conformance. This will include review of QC data, sample tracking, data transcription, instrument calibration, training documentation, and discussion with personnel.

Identification of root cause is one of the keys to corrective action and prevention. It helps identify the actual reason of the error. Some examples of a root cause might be a basic lack of attention by the analyst, or a need for additional resources, proper maintenance of equipment, or a need for training or the need of resources to provide the training, etc. Refer to the beginning of this section for Guidelines on identifying root cause.

17.0 **Waste Management/Pollution Prevention**

17.1 **Waste Management:** All waste materials are to be placed in waste containers, (properly labeled with a “Hazardous Waste” ICON Label). Waste containers should also be labeled with a description of the specific Waste i.e., “Acid Waste”. All waste containers (Satellite or Local to the specific laboratory section) are to be placed and stored in a designated area in the specific laboratory location. When these satellite location containers are full, the waste materials are transferred to the “Hazardous Waste Accumulation Storage Area specific for the type of waste (waste stream). The Accumulation drums are 30-55 gallon drums. Refer to the Laboratory Waste Policy – SOP for details and also see your supervisor for instructions.

17.2 **Waste Management SOPs:** Refer to the SOP “Waste Management”, GL-005, Revision 2, Page 21 of 27 for waste handling and disposal procedures and a listing of “waste streams”. Also refer to the corporate SOP “Waste Management Plan”, GL-039. For handling spills, refer to SOP “CONTINGENCY PLAN EMPLOYEE EMERGENCY RESPONSE AND SAFETY TRAINING”, GL-031, Revision 4, Page 21 of 27, 1/23/09.

17.3 **Pollution Prevention:** Use rinse solutions to clean and rinse all glassware before use to avoid contamination – (But) – do not overuse solvents - to minimize waste produced.

18.0 **References**

- 18.1 OSHA Method ID-215 (Version 2), Occupational Safety & Health Administration US Department of Labor. April 2006.
- 18.2 EPA Method EPA 300.0 Analysis – Inorganic Ions, by Ion Chromatography; Water and Wastewater.
- 18.3 AIHA Module 6.0B. PROFICIENCY TESTING (PT) AND ROUND ROBIN



PROGRAMS FOR INDUSTRIAL HYGIENE LABORATORIES, 6B.3
DEMONSTRATION OF COMPETENCY.

19.0 Tables, Diagrams, etc.

- 19.1 Example Analytical Sequence Order for ID-215**
- 19.2 QC Forms for Hexavalent Chromium OSHA Method ID-215 – QC Summary.**
- 19.3 QC Forms for Hexavalent Chromium OSHA Method ID-215 – Sample Calculation
Page.**



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Example Analytical Sequence Order for ID-215

Label	Concentration
Blank	0.0 ppb
STD 0	1.0 ppb
STD 1	10.0 ppb
STD 3	20.0 ppb
STD 4	60 ppb
STD 5	100 ppb
Note: If using previous calibration curve (valid within 90 days) start run with ICB below.	
ICB	0.0 ppb
IPC	50 ppb
ICB	0.0 ppb
RL	1.0 ppb
CAL	60 ppb
MB	0.0 ppb
LCS	50 ppb
LCSD	50 ppb
Samples	1-10 samples or sample dilutions
IPC	50 ppb
CCB	0.0 ppb
Samples	1-10 samples or sample dilutions
IPC	50 ppb
CCB	0.0 ppb
Samples	1-10 samples or sample dilutions
IPC	50 ppb
CCB	0.0 ppb



19.2 QC Forms for Hexavalent Chromium OSHA Method ID-215 – QC Summary

SPS-10 Rev. 0 Date: 11/19/08

Hexavalent Chromium OSHA Method ID-215									
Analyzed Date:	4/18/2010	Prep Date:	4/18/2010						
Analyst:	MMAZUR								
Sample #	Air Vol. (L)	Cr+6 (ug/L)	DF	Cr+6 (ug/Filter)	RL (ug)	Filter Lot #	RL (ug/M3)		
RL CALCULATOR	1000	1.0	1	10.0	0.010		0.010		
REAGENT BLANK	0	0	1	10.0	0	0.01			
MEDIA BLANK	0	0	1	10.0	0	0.01	% REC LC&LC&D	RPD	
CONTROL # 1	NA	47.118	1	10.0	0.47118	04		0.3	
CONTROL # 2	NA	60.181	1	10.0	0.50181	100			
						Limits:	50.8-120.4	< 15.0	Limit:
						Modified by Bill Chamberlin	(+/- 3 STDEV)		
THEO. Value LCS		50.0				10/21/2009			
Calibration Curve:		1.0	to		100.0	ug/L			



19.3 QC Forms for Hexavalent Chromium OSHA Method ID-215 – Sample Calculation Page

SPS-10 Rev. 0 Date: 11/16/06

Hexavalent Chromium OSHA Method ID-215										Result			
Sample Number	Check or Print	4/18/2010	Prep Date:	4/19/2010				NOT Blank corrected					
Sample Number	or Short Mold	Air Vol. (L)	Cr+6 (ug/L)	DF	FV ml	[ug/liter]	RL [ug/liter]	[ug/M3]	RL [ug/M3]	Total		Comment	
1 F 001684-1	<input type="checkbox"/>	1860.0	78.280	1	10.0	0.763	0.010	0.482	0.0061	0.7734			
C 001684-1	<input type="checkbox"/>	1860.0	61.344	1	10.0	0.513	0.010	0.311	0.0061				
2 F 001684-3	<input type="checkbox"/>	0.0	2.812	1	10.0	0.028	0.010	#DIV/0!	#DIV/0!	0.0261			
C 001684-3	<input type="checkbox"/>	0.0	0.000	1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
3 F 001684-4	<input type="checkbox"/>	0.0	1.421	1	10.0	0.014	0.010	#DIV/0!	#DIV/0!	0.0142			
C 001684-4	<input type="checkbox"/>	0.0	0.000	1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
4 F 001684-1	<input checked="" type="checkbox"/>	289.0	1.128	1	25.0	0.028	0.025	0.101	0.0893	0.1095		Warning Vol.>10ml	
C 001684-1	<input checked="" type="checkbox"/>	289.0	0.000	1	25.0	0.000	0.025	0.000	0.0893			Warning Vol.>10ml	
5 F 001684-2	<input checked="" type="checkbox"/>	320.0	2.355	1	25.0	0.048	0.025	0.184	0.0781	0.1840		Warning Vol.>10ml	
C 001684-2	<input checked="" type="checkbox"/>	320.0	0.000	1	25.0	0.000	0.025	0.000	0.0781			Warning Vol.>10ml	
6 F 001685-1	<input type="checkbox"/>	881.0	4.730	1	10.0	0.047	0.010	0.064	0.0114	0.0637			
C 001685-1	<input type="checkbox"/>	881.0	0.000	1	10.0	0.000	0.010	0.000	0.0114				
7 F 001685-2	<input type="checkbox"/>	883.1	1.858	1	10.0	0.017	0.010	0.018	0.0116	0.0192			
C 001685-2	<input type="checkbox"/>	883.1	0.000	1	10.0	0.000	0.010	0.000	0.0116				
8 F 001685-3	<input type="checkbox"/>	802.1	0.000	1	10.0	0.000	0.010	0.000	0.0168	0.0000			
C 001685-3	<input type="checkbox"/>	802.1	0.000	1	10.0	0.000	0.010	0.000	0.0168				
9 F 001685-4	<input type="checkbox"/>	0.0	0.000	1	10.0	0.000	0.010	#DIV/0!	#DIV/0!	0.0000			
C 001685-4	<input type="checkbox"/>	0.0	0.000	1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
10 F 001684-3	<input checked="" type="checkbox"/>	300.0	2.284	1	25.0	0.047	0.025	0.180	0.0833	0.1903		Warning Vol.>10ml	
C 001684-3	<input checked="" type="checkbox"/>	300.0	0.000	1	25.0	0.000	0.025	0.000	0.0833			Warning Vol.>10ml	
11 F 001684-4	<input checked="" type="checkbox"/>	300.0	1.820	1	25.0	0.041	0.025	0.135	0.0833	0.1350		Warning Vol.>10ml	
C 001684-4	<input checked="" type="checkbox"/>	300.0	0.000	1	25.0	0.000	0.025	0.000	0.0833			Warning Vol.>10ml	
12 F 001684-5	<input type="checkbox"/>	340.0	2.188	1	10.0	0.022	0.010	0.084	0.0294	0.1438			
C 001684-5	<input type="checkbox"/>	340.0	2.888	1	10.0	0.028	0.010	0.084	0.0294				
13 F 001684-6	<input checked="" type="checkbox"/>	180.0	9.087	1	25.0	0.227	0.025	1.258	0.1338	1.7878		Warning Vol.>10ml	
C 001684-6	<input checked="" type="checkbox"/>	180.0	3.804	1	25.0	0.046	0.025	0.528	0.1338			Warning Vol.>10ml	
14 F 001684-7	<input checked="" type="checkbox"/>	0.0	1.375	1	25.0	0.034	0.025	#DIV/0!	#DIV/0!	0.0882		Warning Vol.>10ml	
C 001684-7	<input checked="" type="checkbox"/>	0.0	1.383	1	25.0	0.036	0.025	#DIV/0!	#DIV/0!			Warning Vol.>10ml	
15 F 001602-1	<input type="checkbox"/>	912.0	5.300	1	10.0	0.053	0.010	0.068	0.0110	0.0689			
C 001602-1	<input type="checkbox"/>	912.0	2.802	1	10.0	0.028	0.010	0.032	0.0110				
16 F 001612-1	<input type="checkbox"/>	482.0	134.803	5	10.0	1.348	0.050	4.000	0.1632	4.0995			
C 001612-1	<input type="checkbox"/>	482.0	1.820	1	10.0	0.018	0.010	0.038	0.0216				
17 F	<input type="checkbox"/>			1	10.0	0.000	0.010	#DIV/0!	#DIV/0!	0.0000			
C	<input type="checkbox"/>	0.0		1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
18 F	<input type="checkbox"/>			1	10.0	0.000	0.010	#DIV/0!	#DIV/0!	0.0000			
C	<input type="checkbox"/>	0.0		1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
19 F	<input type="checkbox"/>			1	10.0	0.000	0.010	#DIV/0!	#DIV/0!	0.0000			
C	<input type="checkbox"/>	0.0		1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				
20 F	<input type="checkbox"/>			1	10.0	0.000	0.010	#DIV/0!	#DIV/0!	0.0000			
C	<input type="checkbox"/>	0.0		1	10.0	0.000	0.010	#DIV/0!	#DIV/0!				



Document Revision History

Revision #	Date	Revisions	New Document Name
0	12/01/07	Original Version is the actual method with EMSL Format Headings.	EMSL/Chem/ID215IC Revision 00 12/01/06 Page 1 to 36. Hexavalent Chromium in Air OSHA ID-215
1	11/15/09	Revised into new EMSL SOP format.	WC-058 Revision 1 11/15/09 Page 1 to 22. Hexavalent Chromium in Air by Ion Chromatography OSHA ID-215 Modified
		Added Modified to the Title. Added several new sections: 14.0 Data Assessment and Acceptance Criteria for Quality Control Measures, 15.0 Corrective Actions for Out-of-Control Data, 16.0 Contingencies for Handling Out-of- Control or Unacceptable Data	
		Added Updated QC Form and Sample Excel Master file Printouts.	
		Mike Mazur updated sample preparation section.	
		Added Table Section 1.1.	
		Added Analytical Sequence 19.1.	
2	4/21/2010	Revision to include DEMONSTRATION OF COMPETENCY AIHA Policy for analytes where no formal PT program exists.	WC-058 Revision 2 4/21/2010 Page 1 to 27. Hexavalent Chromium in Air by Ion Chromatography OSHA ID-215 Modified
		Added in new Example QC Forms and Sample Calculation Pages Section 19.2 and 19.3.	
		Updated Section 12.2 Demonstrations of Capability (DOCs) & Section 12.3 DEMONSTRATION OF COMPETENCY .	
		Updated reference section to include AIHA Module reference Section 18.3.	



Title: Hexavalent Chromium in Air by Ion Chromatography OSHA ID-215 Modified

WC-058
Revision 2
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4/21/2010

Signature Page

In signing this, I acknowledge having read and understood the previous pages of this document.

Read and Understood By:

	<u>Print Name</u>	<u>Signature</u>	<u>Date</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
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Attachment 2
Data Summary Tables

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011301787

Sample	249448 (PAM-4)	249418 (PAM-1)	249435 (PAM-2)	249408 (PAM-3)	249437 (PAM-4)	249447 (PAM-6)	249446 (PAM-7)
Collection Date	4/24/2013	4/25/2013	4/25/2013	4/25/2013	4/25/2013	4/25/2013	4/25/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00095 J+	0.0022 J+	0.0020 J+	0.0013 J+	0.0014 J+	0.00071 J+	0.00073 J+

Sample	249412 (PAM-1)	249401 (PAM-2)	249406 (PAM-4)	249403 (PAM-5)	249442 (PAM-6)	249425 (PAM-7)	249410 (PAM-1)
Collection Date	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/26/2013	4/27/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0013 J+	0.0013 J+	0.0011 J+	0.0017	0.0018	0.0033	0.0037

Sample	249417 (PAM-2)	249420 (PAM-3)	249432 (PAM-4)	249413 (PAM-5)	249428 (PAM-6)	249424 (PAM-7)	249404 (PAM-1)
Collection Date	4/27/2013	4/27/2013	4/27/2013	4/27/2013	4/27/2013	4/27/2013	4/28/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0028	0.0038	0.0043	0.0038	0.0042	0.0060	0.0024

Sample	249409 (PAM-2)	249407 (PAM-3)	249441 (PAM-4)	249429 (PAM-5)	249431 (PAM-6)	249411 (PAM-7)
Collection Date	4/28/2013	4/28/2013	4/28/2013	4/28/2013	4/28/2013	4/28/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0038	0.0051	0.0019	0.0011	0.0055	0.0036

Sample	249405	249426
Collection Date	4/25/2013	4/25/2013
Matrix	Field Blank	Media Blank
Hexavalent Chromium (ug/filter)	0.010 U	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011301915

Sample	249439 (PAM-1)	249433 (PAM-2)	249443 (PAM-3)	249449 (PAM-4)	249422 (PAM-5)	249430 (PAM-6)
Collection Date	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013	4/29/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00083 J+	0.0011 J+	0.0020 J+	0.0014 J+	0.0037 J+	0.0017 J+

Sample	249440 (PAM-1)	249423 (PAM-2)	249402 (PAM-3)	249335 (PAM-5)	249337 (PAM-6)	249329 (PAM-1)
Collection Date	4/30/2013	4/30/2013	4/30/2013	4/30/2013	4/30/2013	5/1/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00072 J+	0.0010 J+	0.0037 J+	0.0025 J+	0.0011 J+	0.00072 J+

Sample	249313 (PAM-2)	249327 (PAM-3)	249344 (PAM-4)	249320 (PAM-5)	249326 (PAM-6)	249304 (PAM-1)
Collection Date	5/1/2013	5/1/2013	5/1/2013	5/1/2013	5/1/2013	5/2/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0013 J+	0.0017 J+	0.0017 J+	0.0011 J+	0.0015 J+	0.00078 J+

Sample	249323 (PAM-4)	249338 (PAM-5)	249318 (PAM-6)	249339 (PAM-7)	249317 (PAM-1)	249342 (PAM-2)
Collection Date	5/2/2013	5/2/2013	5/2/2013	5/2/2013	5/3/2013	5/3/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0010 J+	0.00088 J+	0.0016 J+	0.0011 J+	0.0012 J+	0.0014 J+

Sample	249343 (PAM-3)	249340 (PAM-4)	249346 (PAM-5)	249348 (PAM-4)	249309 (PAM-1)	249347 (PAM-4)
Collection Date	5/3/2013	5/3/2013	5/3/2013	5/5/2013	5/4/2013	5/4/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0020 J+	0.0012 J+	0.0015 J+	0.00074	0.0013	0.0014

Sample	249444
Collection Date	4/29/2013
Matrix	Media Blank
Hexavalent Chromium (ug/filter)	0.015

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302079

Sample	249341 (PAM-1)	249244 (PAM-5)	249246 (PAM-7)	249227 (PAM-1)	249220 (PAM-1)	249223 (PAM-2)
Collection Date	5/7/2013	5/7/2013	5/7/2013	5/8/2013	5/11/2013	5/11/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0012 J+	0.00082 J+	0.0013 J+	0.0020 J+	0.0018 J+	0.0015 J+

Sample	249234 (PAM-3)	249247 (PAM-4)	249206 (PAM-5)	249224 (PAM-6)	249218 (PAM-7)	249231 (PAM-1)
Collection Date	5/11/2013	5/11/2013	5/11/2013	5/11/2013	5/11/2013	5/12/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0012 J+	0.0022 J+	0.0018 J+	0.0039 J+	0.00080 J+	0.0012 J+

Sample	249245 (PAM-2)	249229 (PAM-3)	249205 (PAM-5)	249214 (PAM-6)	249216 (PAM-7)	249225 (PAM-1)
Collection Date	5/12/2013	5/12/2013	5/12/2013	5/12/2013	5/12/2013	5/13/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0047 J+	0.0036 J+	0.0021 J+	0.0033 J+	0.0022 J+	0.0036 J-

Sample	249241 (PAM-2)	249201 (PAM-3)	249235 (PAM-4)	249210 (PAM-5)	249204 (PAM-6)	249200 (PAM-7)
Collection Date	5/13/2013	5/13/2013	5/13/2013	5/13/2013	5/13/2013	5/13/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0051 J-	0.0051 J-	0.0042 J-	0.0031 J-	0.0048 J-	0.0021 J-

Sample	249338	249248
Collection Date	5/8/2013	5/13/2013
Matrix	Field Blank 1	Media Blank 1
Hexavalent Chromium (ug/filter)	0.010 U	0.010 U

Qualifier Codes:

- U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.
- J+ - This result should be considered a biased high quantitative estimate.
- J- - This result should be considered a biased low quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302355

Sample	249692 (1)	249696 (2)	249673 (3)	249682 (4)	249686 (5)	249683 (6)	249695 (7)
Collection Date	5/24/2013	5/24/2013	5/24/2013	5/24/2013	5/24/2013	5/24/2013	5/24/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0024	0.0025	0.0030	0.0039	0.0021	0.0028 J+	0.0052 J+

EMSL Project: 011302356

Sample	249610 (PAM-2)	249614 (PAM-3)	249612 (PAM-4)	249615 (PAM-5)	249631 (PAM-6)	249602 (PAM-7)
Collection Date	5/29/2013	5/29/2013	5/29/2013	5/29/2013	5/29/2013	5/29/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0021 J+	0.0022 J+	0.0030 J+	0.0024 J+	0.0039 J+	0.0022 J+

Sample	249634
Collection Date	5/29/2013
Matrix	Media Blank 2
Hexavalent Chromium (ug/filter)	0.010 U

EMSL Project: 011302360

Sample	249662 (PAM-1)	249691 (PAM-2)	249677 (PAM-3)	249688 (PAM-4)	249679 (PAM-5)	249672 (PAM-6)	249652 (PAM-7)
Collection Date	5/23/2013	5/23/2013	5/23/2013	5/23/2013	5/23/2013	5/23/2013	5/23/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0015 J+	0.0013 J+	0.0021 J+	0.0016 J+	0.0023 J+	0.0035 J+	0.0031

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302582

Sample	249629 (PAM-1)	249618 (PAM-2)	249619 (PAM-3)	249635 (PAM-4)	249642 (PAM-6)	249643 (PAM-7)
Collection Date	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00099	0.0025	0.0015	0.0012	0.0021	0.0028

EMSL Project: 011302641

Sample	GTA-1 (PAM-1)	GTA-2 (PAM-2)	GTA-3 (PAM-4)	GTA-4 (PAM-6)
Collection Date	6/12/2013	6/12/2013	6/12/2013	6/12/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0014 J+	0.0021 J+	0.0019 J+	0.0018 J+

EMSL Project: 011302645

Sample	GTA-5 (PAM-1)	GTA-6 (PAM-2)	GTA-7 (PAM-4)	GTA-8 (PAM-6)
Collection Date	6/13/2013	6/13/2013	6/13/2013	6/13/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0018 J+	0.0029 J+	0.0029 J+	0.0027

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302673

Sample	249488 (OSAM-1)	249475 (OSAM-3)	249464 (PAM-1)	249491 (PAM-2)	249497 (PAM-3)	249462 (PAM-4)
Collection Date	6/13/2013	6/13/2013	6/13/2013	6/13/2013	6/13/2013	6/13/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0046	0.0022	0.0016	0.0035	0.0031	0.00097

Sample	249476 (PAM-5)	249493 (PAM-6)	249485 (PAM-7)
Collection Date	6/13/2013	6/13/2013	6/13/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0022	0.0016	0.0016

EMSL Project: 011302674

Sample	249459 (OSAM-1)	249577 (OSAM-2)	249591 (OSAM-3)	249480 (PAM-1)	249593 (PAM-2)	249473 (PAM-3)
Collection Date	6/16/2013	6/16/2013	6/16/2013	6/16/2013	6/16/2013	6/16/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0033 J+	0.0025 J+	0.0025 J+	0.0033 J+	0.0037 J+	0.0039

Sample	249498 (PAM-4)	249584 (PAM-5)	249585 (PAM-6)	249565 (PAM-7)
Collection Date	6/16/2013	6/16/2013	6/16/2013	6/16/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0030	0.0029	0.0026	0.0032

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302677

Sample	249501 (OSAM-3)	249487 (PAM-1)	249455 (PAM-2)	249496 (PAM-3)	249486 (PAM-4)	249463 (PAM-5)
Collection Date	6/11/2013	6/11/2013	6/11/2013	6/11/2013	6/11/2013	6/11/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00091 J+	0.0026 J+	0.00076 J+	0.0012 J+	0.0014 J+	0.0014 J+

Sample	249468 (PAM-6)	249467 (PAM-7)
Collection Date	6/11/2013	6/11/2013
Matrix	Air	Air
Hexavalent Chromium (ug/m ³)	0.0012	0.0071

EMSL Project: 011302678

Sample	249495 (OSAM-1)	249537 (OSAM-2)	249477 (OSAM-3)	249529 (PAM-1)	249500 (PAM-2)	249474 (PAM-3)
Collection Date	6/12/2013	6/12/2013	6/12/2013	6/12/2013	6/12/2013	6/12/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0021	0.0015	0.0020	0.0015	0.0019	0.0053

Sample	249484 (PAM-4)	249465 (PAM-5)	249466 (PAM-6)	249457 (PAM-7)
Collection Date	6/12/2013	6/12/2013	6/12/2013	6/12/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0023	0.0023	0.0040	0.0052

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302680

Sample	249483 (OSAM-2)	249460 (OSAM-3)	249458 (PAM-1)	249478 (PAM-2)	249472 (PAM-3)	249469 (PAM-4)
Collection Date	6/14/2013	6/14/2013	6/14/2013	6/14/2013	6/14/2013	6/14/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0014	0.00075	0.0016	0.0032	0.0026	0.0016

Sample	249490 (PAM-6)	249462 (PAM-7)
Collection Date	6/14/2013	6/14/2013
Matrix	Air	Air
Hexavalent Chromium (ug/m ³)	0.0025	0.0040

Sample	249454
Collection Date	6/14/2013
Matrix	Media Blank
Hexavalent Chromium (ug/filter)	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302682

Sample	GTA-13 (PAM-1)	GTA-14 (PAM-2)	GTA-15 (PAM-4)	GTA-16 (PAM-6)
Collection Date	6/15/2013	6/15/2013	6/15/2013	6/15/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0022	0.0018	0.0016	0.00091

EMSL Project: 011302685

Sample	GTA-9 (PAM-1)	GTA-10 (PAM-2)	GTA-11 (PAM-4)	GTA-12 (PAM-6)
Collection Date	6/14/2013	6/14/2013	6/14/2013	6/14/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0013	0.0020	0.0022	0.0022

EMSL Project: 011302783

Sample	249592 (OSAM-2)	249586 (PAM-1)	249580 (PAM-2)	249588 (PAM-3)	249596 (PAM-5)	249553 (PAM-6)	249597 (PAM-7)
Collection Date	6/17/2013	6/17/2013	6/17/2013	6/17/2013	6/17/2013	6/17/2013	6/17/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00099	0.0012	0.0053	0.0015	0.0013	0.0019	0.0018

Sample	249583
Collection Date	6/17/2013
Matrix	Media Blank 1
Hexavalent Chromium (ug/filter)	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302729

Sample	249521 (1)	249546 (2)	249506 (3)	249505 (4)	249538 (5)	249508 (7)
Collection Date	6/8/2013	6/8/2013	6/8/2013	6/8/2013	6/8/2013	6/8/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0010	0.0022	0.0018	0.0019	0.00077	0.0013

EMSL Project: 011302771

Sample	249456 (OSAM-1)	249481 (OSAM-2)	249489 (OSAM-3)	249471 (PAM-1)	249452 (PAM-2)	249461 (PAM-3)
Collection Date	6/15/2013	6/15/2013	6/15/2013	6/15/2013	6/15/2013	6/15/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0010	0.0018	0.0021	0.0015	0.0018	0.0022

Sample	249453 (PAM-4)	249482 (PAM-6)	249450 (PAM-7)
Collection Date	6/15/2013	6/15/2013	6/15/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0014	0.0027	0.0017

Sample	249479 (PAM-1)
Collection Date	6/15/2013
Matrix	Filter Blank
Hexavalent Chromium (ug/filter)	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302826

Sample	249549 (2)	249502 (3)	249547 (4)	249528 (5)	249518 (7)
Collection Date	6/7/2013	6/7/2013	6/7/2013	6/7/2013	6/7/2013
Matrix	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0059	0.0010	0.0011	0.0033	0.0034

EMSL Project: 011302840

Sample	249698 (1)	249655 (2)	249666 (3)	249684 (4)	249651 (5)	249653 (6)	249656 (7)
Collection Date	5/26/2013	5/26/2013	5/26/2013	5/26/2013	5/26/2013	5/26/2013	5/26/2013
Matrix	Air	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0022 J-	0.0028 J-	0.0024 J-	0.0028 J-	0.0054 J-	0.0021 J-	0.0019 J-

EMSL Project: 011302841

Sample	249215 (PAM-2)	249249 (PAM-3)	249237 (PAM-6)	249202 (PAM-7)
Collection Date	5/14/2013	5/14/2013	5/14/2013	5/14/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0022 J-	0.0013 J-	0.0016 J-	0.0017 J-

Qualifier Codes:

J- - This result should be considered a biased low quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302859

Sample	GTA-17 (PAM-1)	GTA-18 (PAM-2)	GTA-19 (PAM-4)
Collection Date	6/20/2013	6/20/2013	6/20/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0024	0.0017	0.0020

EMSL Project: 011302860

Sample	249556 (OSAM-1)	249558 (OSAM-2)	249590 (OSAM-3)	249571 (PAM-1)	249587 (PAM-2)	249562 (PAM-3)
Collection Date	6/19/2013	6/19/2013	6/19/2013	6/19/2013	6/19/2013	6/19/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0022	0.0020	0.0018	0.0010	0.0018	0.0025

Sample	249570 (PAM-4)	249559 (PAM-5)	249573 (PAM-6)
Collection Date	6/19/2013	6/19/2013	6/19/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0014	0.0030	0.0020

Qualifier Codes:

Not Data Qualifiers Required.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302876

Sample	GTA-25 (PAM-1)	GTA-26 (PAM-2)	GTA-27 (PAM-4)	GTA-28 (PAM-6)
Collection Date	6/22/2013	6/22/2013	6/22/2013	6/22/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0019 J+	0.0015 J+	0.0016 J+	0.0015 J+

EMSL Project: 011302877

Sample	GTA-21 (PAM-1)	GTA-22 (PAM-2)	GTA-23 (PAM-4)	GTA-24 (PAM-6)
Collection Date	6/21/2013	6/21/2013	6/21/2013	6/21/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0020 J+	0.0047 J+	0.0027 J+	0.0019 J+

EMSL Project: 011302878

Sample	GTA-29 (PAM-1)	GTA-30 (PAM-2)	GTA-31 (PAM-4)	GTA-32 (PAM-6)
Collection Date	6/23/2013	6/23/2013	6/23/2013	6/23/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0013 J+	0.0023 J+	0.0019 J+	0.0014 J+

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302879

Sample	249578 (OSAM-1)	249594 (OSAM-2)	249552 (PAM-1)	249550 (PAM-2)	249568 (PAM-3)	249567 (PAM-4)
Collection Date	6/18/2013	6/18/2013	6/18/2013	6/18/2013	6/18/2013	6/18/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0017	0.00071	0.0012	0.0019	0.0012	0.0016

Sample	249595 (PAM-5)	249561 (PAM-6)	249563 (PAM-7)
Collection Date	6/18/2013	6/18/2013	6/18/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0024	0.0024	0.0014

Sample	249557 (PAM-1)
Collection Date	6/18/2013
Matrix	Field Blank 1
Hexavalent Chromium (ug/filter)	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302880

Sample	249694 (1)	249676 (2)	249697 (3)	249667 (4)	249664 (5)	249699 (6)
Collection Date	5/25/2013	5/25/2013	5/25/2013	5/25/2013	5/25/2013	5/25/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0012 J-	0.0042 J-	0.0015 J-	0.0025 J-	0.0022 J-	0.0042 J-

Sample	249665 (7)
Collection Date	5/25/2013
Matrix	Air
Hexavalent Chromium (ug/m ³)	0.0077 J-

Sample	249685
Collection Date	5/25/2013
Matrix	Field Blank 1
Hexavalent Chromium (ug/filter)	0.010 UJ

Qualifier Codes:

UJ - This analyte was not detected. The reporting limit should be considered a biased low quantitative estimate.

J- - This result should be considered a biased low quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302889

Sample	249649 (PAM-1)	249645 (PAM-2)	249626 (PAM-3)	249606 (PAM-4)	249603 (PAM-5)	249639 (PAM-6)
Collection Date	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0028	0.0014	0.0038	0.0020	0.0019	0.0036

Sample	249641 (PAM-7)
Collection Date	6/2/2013
Matrix	Air
Hexavalent Chromium (ug/m ³)	0.0029

EMSL Project: 011302890

Sample	249569 (OSAM-1)	249589 (OSAM-2)	249576 (OSAM-3)	249582 (PAM-1)	249555 (PAM-2)	249579 (PAM-3)
Collection Date	6/20/2013	6/20/2013	6/20/2013	6/20/2013	6/20/2013	6/20/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00085	0.0017	0.00076	0.0018	0.0016	0.00098

Sample	249566 (PAM-5)	249551 (PAM-6)	249560 (PAM-7)
Collection Date	6/20/2013	6/20/2013	6/20/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00089	0.00092	0.0016

Qualifier Codes:

No Data Qualifiers Required.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302902

Sample	93945 (OSAM-1)	93982 (OSAM-2)	93989 (OSAM-3)	93974 (PAM-1)	93950 (PAM-2)	93968 (PAM-3)
Collection Date	6/21/2013	6/21/2013	6/21/2013	6/21/2013	6/21/2013	6/21/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0054	0.0070	0.0036 J+	0.0043	0.0043	0.0059

Sample	93973 (PAM-4)	93966 (PAM-5)	93948 (PAM-6)	93958 (PAM-7)
Collection Date	6/21/2013	6/21/2013	6/21/2013	6/21/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0054	0.0081	0.0052	0.0028

Sample	93964	93978
Collection Date	6/21/2013	6/21/2013
Matrix	Media Blank 1	Field Blank 1
Hexavalent Chromium (ug/filter)	0.010 U	0.010 U

Qualifier Codes:

- U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.
- J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011302903

Sample	93946 (OSAM-1)	93942 (OSAM-2)	93979 (OSAM-3)	93965 (PAM-1)	93953 (PAM-2)	93944 (PAM-3)
Collection Date	6/22/2013	6/22/2013	6/22/2013	6/22/2013	6/22/2013	6/22/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0038	0.0059	0.0057	0.0040	0.0036 J+	0.0044

Sample	93943 (PAM-4)	93955 (PAM-5)	93976 (PAM-6)	93985 (PAM-7)
Collection Date	6/22/2013	6/22/2013	6/22/2013	6/22/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0040	0.0032 J+	0.0041 J+	0.0027 J+

EMSL Project: 011302949

Sample	93980 (OSAM-1)	93987 (OSAM-2)	93988 (PAM-1)	93969 (PAM-2)	93954 (PAM-3)	93986 (PAM-4)
Collection Date	6/23/2013	6/23/2013	6/23/2013	6/23/2013	6/23/2013	6/23/2013
Matrix	Air	Air	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0018	0.023	0.0045	0.0019	0.0013	0.0013

Sample	93961 (PAM-5)	93951 (PAM-6)	93947 (PAM-7)
Collection Date	6/23/2013	6/23/2013	6/23/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.00095	0.0019	0.0027

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011303000

Sample	93963 (OSAM-1)	93949 (OSAM-3)	93960 (OSAM-4)
Collection Date	6/25/2013	6/25/2013	6/25/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0095	0.013	0.011

EMSL Project: 011303002

Sample	93977 (OSAM-1)	93962 (OSAM-3)	93940 (OSAM-4)
Collection Date	6/26/2013	6/26/2013	6/26/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0044 J+	0.011	0.011

EMSL Project: 011303003

Sample	93984 (OSAM-1)	93970 (OSAM-3)	93952 (OSAM-4)
Collection Date	6/27/2013	6/27/2013	6/27/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0074	0.010	0.010

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011303050

Sample	93999 (OSAM-1)	94019 (OSAM-2)	94035 (OSAM-3)	94036 (OSAM-4)
Collection Date	6/29/2013	6/29/2013	6/29/2013	6/29/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0025	0.0028	0.0048	0.0062

EMSL Project: 011303052

Sample	93956 (OSAM-1)	93972 (OSAM-2)	93959 (OSAM-3)	93975 (OSAM-4)
Collection Date	6/28/2013	6/28/2013	6/28/2013	6/28/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0020	0.0024	0.0025	0.0036

EMSL Project: 011303053

Sample	94009 (OSAM-1)	94001 (OSAM-2)	93992 (OSAM-3)	94002 (OSAM-4)
Collection Date	7/1/2013	7/1/2013	7/1/2013	7/1/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0047	0.0058	0.0037	0.0041

Sample	94000 (OSAM-1)	94012 (OSAM-1)
Collection Date	7/1/2013	7/1/2013
Matrix	Media Blank	Filter Blank
Hexavalent Chromium (ug/filter)	0.010 U	0.010 U

Qualifier Codes:

U - This analyte was not detected. The numerical value reported represents the sample reporting limit for the analyte.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011303054

Sample	93990 (OSAM-1)	94003 (OSAM-2)	94033 (OSAM-3)	94031 (OSAM-4)
Collection Date	6/30/2013	6/30/2013	6/30/2013	6/30/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0059	0.0020	0.0033	0.0020

EMSL Project: 011303111

Sample	94039 (OSAM-1)	94032 (OSAM-2)	94010 (OSAM-4)
Collection Date	7/3/2013	7/3/2013	7/3/2013
Matrix	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0029 J+	0.0021 J+	0.0095

EMSL Project: 011303112

Sample	94005 (OSAM-1)	94037 (OSAM-2)	94011 (OSAM-3)	94017 (OSAM-4)
Collection Date	7/4/2013	7/4/2013	7/4/2013	7/4/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0060	0.0049	0.0077	0.0040

Qualifier Codes:

J+ - This result should be considered a biased high quantitative estimate.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011303113

Sample	93995 (OSAM-1)	94029 (OSAM-2)	94016 (OSAM-3)	94015 (OSAM-4)
Collection Date	7/5/2013	7/5/2013	7/5/2013	7/5/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0054	0.0036	0.0035	0.0089

EMSL Project: 011303114

Sample	94023 (OSAM-1)	94021 (OSAM-2)	94026 (OSAM-3)	94013 (OSAM-4)
Collection Date	7/2/2013	7/2/2013	7/2/2013	7/2/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0023	0.0026	0.0041	0.0031

EMSL Project: 011303224

Sample	93997 (OSAM-1)	94024 (OSAM-2)	94007 (OSAM-3)	94004 (OSAM-4)
Collection Date	7/8/2013	7/8/2013	7/8/2013	7/8/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0024	0.0020	0.0015	0.0030

Qualifier Codes:

No data qualifiers required.

Final Validated Analytical Results
Hexavalent Chromium
Harbor Point - Area 1
Baltimore, Maryland

EMSL Project: 011303225

Sample	94027 (OSAM-1)	94025 (OSAM-2)	94020 (OSAM-3)	94006 (OSAM-4)
Collection Date	7/7/2013	7/7/2013	7/7/2013	7/7/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0024	0.0030	0.0030	0.0048

EMSL Project: 011303226

Sample	93996 (OSAM-1)	94022 (OSAM-2)	94028 (OSAM-3)	93998 (OSAM-4)
Collection Date	7/9/2013	7/9/2013	7/9/2013	7/9/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0021	0.0036	0.0051	0.0031

EMSL Project: 011303227

Sample	94038 (OSAM-1)	94030 (OSAM-2)	94014 (OSAM-3)	93993 (OSAM-4)
Collection Date	7/6/2013	7/6/2013	7/6/2013	7/6/2013
Matrix	Air	Air	Air	Air
Hexavalent Chromium (ug/m ³)	0.0028	0.0019	0.0037	0.0050

Qualifier Codes:

No data qualifiers required.

Attachment 3
Reviewer's Credentials

Joseph M. Loeper, Ph.D.

Qualifications and Experience

Thirty-three years of general experience with analytical chemistry. The last twenty-seven years were involved with environmental testing, providing Quality Assurance (QA) oversight for numerous projects and managerial/technical support for fixed laboratory and field analytical events. Specific program experience includes RCRA, Department of Energy (DOE), Superfund, Department of Defense (DOD), Maryland Department of the Environment, Pennsylvania DEP, New Jersey DEP, and New York State DEC.

As a senior chemist and manager in Data Validation and Quality Assurance, Dr. Loeper has a wide range of experiences. These include the technical management of chemists performing data validation according to the USEPA National Functional Guidelines, coordination and oversight of laboratory support for non-routine analysis, development of QAPjP's, and responsibility for laboratory audits and laboratory approval processes.

Dr. Loeper's laboratory experience includes a significant focus in the arenas of both field and fixed-base analytical laboratory support. Field analytical projects required the design, set-up and management of on-site laboratory facilities in support of investigations and remediations performed at RCRA, DOE and DOD facilities. The field techniques utilized both screening methods and enhancements to standard EPA methods to yield rapid turnaround results. Experience within a fixed base laboratory environment required familiarity with EPA's standard methods of analysis and methods development experience for projects requiring analytical support for non-routine compounds.

His laboratory background also includes experience in the design and implementation of various experiments in a Treatability Laboratory. The primary focus of the facility was the the evaluation of in situ remediation technologies, which included metals stabilization and fixation, and chemical oxidation processes (hydrogen peroxide, Fenton's Reagent, potassium permanganate, and sodium persulfate).

Credentials

- Ph.D., Analytical Chemistry - Villanova University (1987)
- M.S., Analytical Chemistry - Villanova University (1985)
- B.S., General Sciences - Villanova University (1979)

Publications

"Bench Scale Evaluation of Chemical Reduction as a Treatment Technology for Hexavalent Chromium," ORTs-2, Toronto, Canada (2002).

"Analytical Data QA/QC, Validation, and Management," WEFTEC 2001 Workshop, Atlanta, Georgia (2001).

"Environmental Applications of Gas Chromatography," in Modern Practice of Gas Chromatography, 3rd Edition, R.L.Grob (Ed), Wiley, New York (1995).

"Comparison of Analytical Methods for the Determination of PCBs in Non-Aqueous Liquids," Superfund XV, Washington, D.C. (1994).

"Gas Chromatographic Methods for the Determination of Explosives in Environmental Samples," 33rd Eastern Analytical Symposium, New Jersey (1994).

"Analytical Method Evaluation for Low Level PCBs in Pipeline Condensate," EPRI-PCB Seminar, New Orleans (1993).

"Chemical Analysis of Amino-Nitrotoluene Isomers in the Presence of HMX, RDX and TNT," Workshop on Explosives Contaminated Soil, Wilmington Delaware. (1993).

"Determination of Water in Solid Samples Using Headspace Gas Chromatography," Journal of Chromatography, 463, 365-374 (1989).

"Computer Automation of Volatile Organic and Pesticide/PCB Analyses," Pittsburgh Conference, Atlanta (1988).

"Indirect Method for the Determination of Water Using Headspace Gas Chromatography," Journal of Chromatography, 457, 247-256 (1988).

Key Projects

Analytical QA/QC Task Manager responsible for the development of a Quality Assurance Project Plan (QAPP) in support of an RI/FS at a former pesticide manufacturing facility in Maryland. The project required analysis for standard TCL volatile and semivolatile organic compounds, TCL pesticide/PCB compounds, TAL metals, and a suite of additional pesticide compounds handled by non-standard methods of analysis. The QAPP was approved for the project by the Maryland Department of the Environment.

Provided QA oversight during the preparation of a QAPP required for a remediation at a former fragrances and flavors manufacturing facility. The project required the implementation of an air monitoring program to evaluate on-site and off-site exposures to potential airborne chemical releases triggered by the remediation system. The monitoring plan incorporated both rapid field screening methodologies to identify releases in real-time and conventional EPA methods to verify that long-term exposure levels remained below the Health Based Risk Criteria during the remediation. The QAPP was reviewed and accepted for the project by the New Jersey Department of Environmental Protection.

Served as the lead chemist for a project providing QA support for a municipal waste authority. The initial phase of the project required technical oversight for the identification of laboratories capable of performing the analyses required to monitor the operations of the facility. This was followed by an on-site laboratory inspection of the proposed laboratory and annual follow-up audits to evaluate the laboratory performance.

Analytical QA/QC manager for a Department of Defense (DOD) Army Environmental Center (AEC) Investigation in Maryland (USEPA Region III), with responsibility for the technical oversight of chemists and technicians performing the data validation review of the associated chemical analysis data. Validated data included analyses for nitroaromatic and nitramine explosive compounds, volatile organic compounds (VOCs), semivolatile organics (SVOCs), Herbicides, Pesticides and PCBs, and TAL metals. Analytical methods included SW-846 and USAEC approved methods for analyses performed by both on-site and fixed-base laboratories. Over fifty Quality Assurance Reports were prepared for the project.

Validation and implementation of NYSDEC Method 91-11 for the low-level determination of PCB congeners by Capillary Column GC/ECD analysis.

Lead chemist for the development and validation of a method to provide rapid turnaround results for polychlorinated dioxins and furans in discarded

electrical insulation material. The analytical approach focused on the development of a technique to measure key dioxins and furans and the correlation of these concentrations to a "TCDD Toxicity Equivalent" for the material.

Evaluation and validation of Immunoassay test kits for field measurement of explosives (RDX and TNT), PCBs and BTEX contamination.

Technical and administrative oversight of over twenty-five chemists and technicians performing organic sample prep and GC/HPLC analysis for various government and commercial clients. Major projects included support for numerous DOE Contractors, site investigations as part of a HAZWRAP contract, contamination assessments as part of a Formerly Utilized Sites Remedial Action Program (FUSRAP), support for numerous RI/FSs, and high-priority analytical services for NYSDEC's toxic and hazardous materials program.

Project management and technical support for Special Analytical Services required to delineate low-level PAH contamination at a Superfund Site. This included method development and validation of a Selected Ion Monitoring (SIM) GC/MS technique.

Technical guidance on the preparation of Chemical Data Acquisition Plans (CDAPs) for USACE projects at various sites.

Lead chemist for a NEESA contract requesting analysis for liquid propellants in soil and water matrices. The project required an evaluation of analytical options with method development and validation for the appropriate technique. The GC method developed for the project was approved and utilized for the investigation at the site. The data generated by this GC method also underwent a third party validation.